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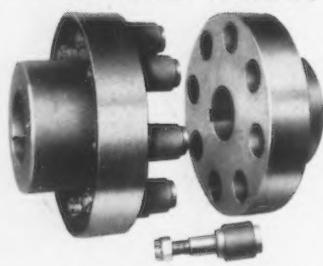


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DECEMBER 25, 1941

VOL. 148, NO. 26



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Member, Audit Bureau of Circulations
Member, Associated Business Papers
Indexed in the Industrial Arts Index. Published every Thursday. Subscription Price
United States and Possessions, Mexico, Cuba, and South America, \$6.00; Canada, \$8.50; Foreign, \$12.00 a year.
Single copy, 25 cents.

Cable Address "Ironage N. Y."

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Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Office Editorial and
Advertising Offices
Chestnut and 56th Sts. 100 East 42nd St.
Philadelphia, Pa. New York, N. Y.
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THE IRON AGE

DECEMBER 25, 1941

ESTABLISHED 1855



A Word About White Collars

STATISTICIANS tell us that wage income in the United States is expected to be approximately \$10 billion more than in 1940, or an increase of 21 per cent. Cost of living is expected to show an increase of not more than 10 per cent for the same period.

From this it would appear that American labor is keeping more than its head above water.

We have to take into consideration, however, that this difference between total wages and the cost of living does not accurately reflect a similar increase in individual buying power of workers. It would do that if the same number of workers were at work now as were a year ago. But since then, some four million new people have come into industry. And while their wages represent increased general purchasing power, it does not affect the purchasing power of those who were already employed.

Many of these old timers, who are paid on an hourly basis, have fared pretty well, especially in our metal-working industry. Wage increases, continuity of employment and overtime have, in many cases, increased the contents of pay envelopes of hourly workers to hitherto unprecedented proportions.

Some of our workers who are paid fixed weekly wages or salaries and who have not participated in wage increases, find themselves going backwards, so to speak, because of the upward movement of living costs. There have been notable exceptions, of course, in our own metal working industry, where managements have made voluntary adjustments in white collar salaries where similar action has been previously taken with hourly wages.

By and large, white collar employment is more stable than hourly employment and those enjoying the prospect of continuity cannot expect the same degree of adjustment as given to those whose employment and earnings are obviously on a-pro tem. basis.

From now on, in an all out war economy, no one can expect to maintain his position relative to the cost of living, to say nothing of improving it. Taxes and defense bonds will take care of that. The war will have to be paid for by the tightening of belts on the part of all. But before this tightening process gets under way, it will be good business on the part of progressive management to see that the relative position of the white collar worker is given due consideration. White collars are as necessary to winning a war as khaki, navy blue or overalls.



Refugee kiddies inspect a new ambulance presented by the British-American Ambulance Corps.

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Metallurgy of Aircraft Engines

SINCE outbreak of the war many English, French and American airplanes have fallen inside Germany. Naturally German engine builders and manufacturers lost no time in investigating the planes, their armament, equipment and engines. A recent issue of *Aircraft Engineering*, London, transcribes a report of the German aircraft technician P. Kotzschke on five English, three French, and two American planes recently captured. The results of research on these planes, carried out on behalf of the Reich Air Ministry by German engine builders and manufacturers of component aircraft parts, and by the D. V. L., the German Aeronautical Research Institute, are included in an elaborate report, a summary of the more important features of engine construction being set forth herein.

Three in-line, five twin-radial and three single-radial engines of British, French and American origin were examined for the type of materials used in their manufacture and the design features of their highly stressed parts. Generally, it was determined by German metallurgists that steels used for crankshafts, connecting rods, valves and gears contained higher percentages of chromium, nickel, tungsten and other alloys than considered necessary by German standards for the same stressing. It was pointed out that the lowest alloy percentages were in general found in American steels, the quality corresponding closely to equivalent German materials. The surface finishes were not so good as in German engines and good finishes were confined, particularly in the American designs, to the most highly stressed parts. Nitriding is

employed to a greater extent than in German practice. Also, in addition to the bearing metals commonly used in Germany, designers of French, English and American planes made use of cadmium-nickel alloys and lead-bronzes with high tin or silver content. Light alloys are utilized in very much the same manner as in German practice.

Several of the engines examined were old models, representing the initial stage in the development of a model or a production series. However, it is pointed out that in such development it is customary to retain the materials and production methods and vary just the design features. Examination of the English Rolls-Royce Merlin II and X models confirmed this assumption, since the newer model, X, differs from the older only in details, except for a different connecting rod arrangement.

The cylinder volumes of the engines vary from 1159.42 cu. in. to 2379.85 cu. in., and the weight per unit power fluctuates between 1.15 and 1.61 lb. per hp., being most favorable for the Rolls-Royce and Hispano-Suiza engines. Although of relatively modern design, the American Cyclone and Twin Wasp engines have a relatively high weight per unit power.

Crankshaft Steels

The chemical compositions and types of steel used in the crankshafts of the captured engines are

shown in Table I. It is obvious that in each country there is a tendency to standardize crankshaft materials, irrespective of the type of engine. The crankshafts for British Merlin and Mercury engines are both of nitrided steel, differing from German materials by containing 0.7 per cent nickel. The crankshaft of the Rolls-Royce has 0.8 to 1 per cent molybdenum.

The steel in the French Gnome-Rhone and Hispano-Suiza engines is a chrome-nickel-molybdenum alloy, rather high in alloy content according to German standards, particularly in molybdenum content of 1.25 to 2 per cent in the Hispano-Suiza engines. The strength of crankshafts in the French engines is 177,790 lb. per sq. in., after heat treatment. The journals are not case hardened, although Hispano-Suiza used a case hardening steel with lead-bronze bearings.

The front portion of the American Cyclone crankshaft is distinctly low alloy steel, with 0.4 per cent carbon and 0.7 per cent chromium, heat treated and hardened to 149,344 lb. per sq. in. The rear portion is a chromium-nickel steel corresponding to the German VCN 35 standard steel. The heat treated strength is about 142,232 lb. per sq. in. The crankshaft of the American Twin-Wasp radial engine is a case hardening nickel steel with about 4.5 per cent nickel, heat treated to 163,567 lb. per sq. in. core strength. The crank pins are

**The Germans report on the steels and treatments employed in American, British and French aircraft engines.
Their attitude is one of smug satisfaction.**

case hardened to a depth of between 0.03149 and 0.03543 in.

The Merlin and Mercury shafts are nitrided throughout to a depth of 0.0118 to 0.0236 in. A maximum hardness of 619 Brinell was found in one crank web of the Merlin X crankshaft. The bearing surfaces, on the other hand, owing to grinding losses, have on the average a hardness of only 460 to 535 Brinell. The nitration depth of this crankshaft is nearly 0.0236 in., showing that a prolonged treatment has been applied. It is interesting to note that with a core strength of 142,232 lb. per sq. in., the impact strength is quite high, the favorable values being probably explained by the high molybdenum content, preventing brittleness in spite of the long nitriding period.

The front crankshaft section of the Bristol engine (nitrided all over) is heat treated to a core strength of only 128,000 lb. per sq. in., possibly to avoid brittleness which might result by higher heat treatment in the absence of sufficient molybdenum. The steel of the middle crankshaft section is equivalent to the German VCN 35.

The design of the Merlin crankshaft is interesting because of its thick but narrow webs. The boring is cylindrical, and the fillets between the webs are of the very small radius of 0.0157 in. The grain shows no irregularities, but in the bore there is occasional circumferential grooving. The boring of the nitrided oil passage in the crank pin gives evidence of tool marks, but it is uncertain whether this materially impairs the fatigue strength, as the nitrided layer on

the edge of the borehole would considerably reduce the risk of fracture. The bending fatigue strength of the shaft for reversed stress as determined at some of the crank throws reaches a favorable value.

The Hispano-Suiza engine crankshafts differ in design from those of all the other engines. Since a round connecting-rod is used, a wide big-end bearing is necessary and therefore the crank webs must be very narrow. In order to insure sufficient moment of resistance, the webs are circular disks without counterweights, this design being in some respects more favorable for production than the approximately egg or oval shaped webs of the German and the Rolls Royce engines.

In the Gnome-Rhone 14 N and 14 M S engines, the front and rear crankshaft portions, each with a forged-on crankpin, are connected by means of a rigid, separate intermediate web, each pin being clamped by means of two bolts. The counterweights are riveted on.

The crankshafts of the American twin-wasp and of the smaller Armstrong twin-radial Tiger are in one piece. Contrary to the British engine, the Twin-Wasp has, however, an intermediate bearing, sufficiently large to enable the inner roller race to be pushed on over the pin and throw. This results in a circular intermediate web of great torsional strength, with prismatic web projections on each side. The crankpin is bored cylindrically and the oil passages, while not case hardened, are individually bushed.

Connecting Rods

Connecting rod materials do not appear to be standardized in the various countries as are crankshaft materials, as indicated in Table II. However, nickel or chromium-nickel steels are generally used and it is again apparent that the French engineers were the most lavish in their use of high alloy steels, using high grade chromium-nickel alloys with high percentages of molybdenum. Again, the American Wright Cyclone uses the lowest alloy steel. The Twin-Wasp, however, agrees with the French practice in using for connecting rods a chromium-nickel-molybdenum steel, remarkably high in molybdenum. British engines use steels practically free from molybdenum. With one exception, the connecting rods have strength values from 142,232 to 184,786 lb. per sq. in., but in the Mercury the connecting rods are heat treated to 241,795 lb. per sq. in., which is unusual in airplane engine practice. The advantage of the higher strength, of course, is in the reduced weight, although the notch sensitivity must increase with such high heat treatment. None of the engines examined had nitrided connecting rods.

In several respects, the connecting rod designs are noteworthy. Some of them deviate greatly from German practice with regard to shape of the shaft. The master rod of the Merlin is in three parts, consisting of the rod itself and the upper and lower bearing caps. The upper caps are made of case hardening nickel steel with about 5 per

TABLE I Crankshaft Materials of Captured Airplane Engines

Make of Engine	Chemical Composition, Per Cent						Steel Type	Superficial Hardness, Kg. Per Sq. Mm.	Core Strength, Lb. Per Sq. In.	Remarks
	C	Si	Mn	Cr	Ni	Mo				
Rolls-Royce Merlin X	0.33	0.24	0.75	1.18	0.72	1.04	Nitriding	622-676	142,232	Nitrided 0.0157 in. overall
Rolls-Royce Merlin II	0.36	0.23	0.76	1.16	0.77	0.84	Nitriding	543-638	156,455	Nitrided 0.0118 in. overall
Hispano-Suiza 12 Y crs	0.17	0.30	0.62	1.41	4.68	1.24	.....	.....	177,790	Heat treated
Gnome-Rhone 14 M 6	0.22	.....	.....	1.42	4.67	0.51	.....	.....	177,790	Heat treated
Pratt & Whitney Twin-Wasp	0.21	0.3	0.6	<0.1	4.62	0.04	.....	620	163,567	Running surfaces case hardened 0.0314 in.
Wright-Cyclone G. 102-1 Forepart	0.43	0.25	0.81	0.72	<0.1	<0.1	.....	.....	149,344	Heat treated
Bristol Mercury VIII Forepart	0.30	.....	0.71	1.24	0.66	<0.1	Nitriding	600-700	128,009	Nitrided 0.0197 in. overall, heat treated
After Part	0.35	.....	0.65	0.68	3.38	<0.1	.....	.....	142,232	

TABLE II Connecting Rod Materials of Captured Airplane Engines

Make of Engine	Chemical Composition, Per Cent						Core Strength, Lb. Per Sq. In.
	C	Si	Mn	Cr	Ni	Mo	
Rolls-Royce Merlin II							
Master rod	0.40	0.20	0.75	0.26	3.42	0.1	142,232
Top and bottom bearing caps	0.10	0.29	0.40	0.10	4.93	0.1	113,786
Auxiliary rod	0.38	...	...	0.30	3.40	...	142,232
Hispano-Suiza							
Master rod	0.30	0.14	0.50	1.07	3.05	0.56	170,679
Auxiliary rod	0.27	0.21	0.54	1.25	3.19	0.48	170,679
Gnome-Rhone							
Master rod	0.26	0.19	0.29	1.0	3.9	0.4	149,344
Auxiliary rod	0.25	0.18	0.32	1.08	4.08	0.63	156,455
Pratt & Whitney	0.41	0.27	0.76	0.76	1.73	0.6	170,679
Wright-Cyclone							
Master rod	0.44	0.30	0.71	0.76	1.66	...	170,679
Auxiliary rod	0.40	0.28	0.58	0.76	1.85	0.28	...
Bristol Mercury							
Master rod	0.29	...	0.53	1.23	4.28	0.1	184,902
Auxiliary rod	0.30	0.10	0.46	1.34	4.33	0.15	184,902

cent nickel, lead-bronze being cast directly both on the inside and outside of the caps in the Merlin II. The bearing caps are particularly low in carbon, about 0.1 per cent, obviously to prevent warping and probably to reduce the crack sensitivity under tension.

A different design of bearing has been adopted in the Merlin X. It is not clear whether the alteration is due to difficulties in casting the bearing surface directly on to the caps or to failure in service. In the Merlin X, both master and subsidiary big-ends are provided with split steel liners, 0.03937 in. thick, with a cast-on lead-bronze layer of 0.01968 in. thick. These liners are made of a nickel case hardening steel, containing 2.5 per cent nickel and 0.1 per cent carbon. The bearing caps of the Merlin X are now no longer made of 5 per cent nickel case hardening steel, but of the same material as the shanks, a chrome-nickel steel similar to the German VCN 35. The split liner in the subsidiary rod big end is provided with a cast-on layer of very hard ternary bronze, of similar composition to that used in the Merlin II, and runs on the outer surface of the bearing caps of the master rod. These bearing caps are heat treated to about 149,300 lb. per sq. in., but not case hardened. The use of case hardened nickel steel with cast-on-lead-bronze for bearing caps in the Merlin II or

liners in the Merlin X is of special interest because German bearing manufacturers consider such steels unsuitable, as they are liable to crack after hardening. It must, however, be remembered that pure nickel case hardening steels as used in the Merlin were not tried in Germany for obvious economic reasons.

The shanks of the master and subsidiary rods of the Hispano Suiza engine differ from other designs in that they are of circular section. Toward the big end, the thickness of the walls increases from 0.1574 to 0.2362 in. The tapered hole starts at the little end and, in order to strengthen the big end, the drilling is not carried right through. The end of the bore hole is well rounded in order to reduce notch sensitivity. While rounded shanks are more easily manufactured than the double T section used in German designs, they lead to an increase in the width of the subsidiary rod assembly. The bearing cap assembly in the Hispano Suiza subsidiary rod is also noteworthy. The rod is provided with four parallel lugs on each side, between which are inserted three corresponding lugs attached to the cap, the assembly being secured by two pins under shear.

Deviating from the usual practice of modern radial engine design, the master rod of the Twin-Wasp is in two parts, necessitated by the one piece construction of the crank-

shaft. In the Wright Cyclone, the double T of the connecting rod is turned through 90 deg. The flanges of the rod are thus in line with the big end flange housing the knuckle pins of the auxiliary rods, while the web of the rod is in the plane of the engine axis. This has the advantage from the point of view of production that big end and rod flange can be milled in one operation on a special miller. It is not possible, however, to use a forging approximating closely the final shape, and the amount of machining involved must be considerable. A further disadvantage of the design is the fact that the flow of the grain is now interrupted and the shaft is relatively weaker than the standard design. It must also be noted that the big end bore of this engine is plated with hard chromium to prevent surface damage when inserting or removing the bearing bushing.

Gnome-Rhone and Bristol Mercury engines have no special features insofar as their connecting rod construction is concerned.

Nitrided Cylinder Liners

As shown in Table III, the cylinder liners of most of the foreign engines examined were of the most varied composition. Apparently each firm has had special experience with a definite grade of steel. Thus, simple carbon steels are used

for the Merlin and Tiger; heat treated chromium-molybdenum steels for the Twin-Wasp; chromium-molybdenum nitrided steels, containing aluminum, for Hispano-Suiza and Cyclone; chromium without aluminum for the Gnome-Rhone; and finally, chromium-nickel nitrided steels for the Mercury. This confirms early observations that the majority of foreign engines utilize nitrided cylinder liners.

While the majority of the nitrided steels used are similar to those used in Germany, Bristol uses a chromium steel without either molybdenum or aluminum. The thickness of the nitrided layer in the finished liner varies from 0.003937 to 0.01968 in. The surface hardness corresponds to Vickers hardness numbers between 700 and 900 kg. per sq. m.m., with a core strength of 113,787 to 156,455 lb. per sq. in. The Merlin engine uses a simple carbon steel with 0.6 per cent carbon heat treated to a very high strength of 163,567 lb. per sq. in. The peculiar sorbitic structure of the material along the whole length of the liner is interesting and is apparently produced by hardening in a high temperature bath. This structure possibly affects the running properties of the liner.

The cylinder liner of the Bristol Hercules sleeve-valve engine is of special design. The cylinder is of special wrought alloy, RR 56, heat

treated. The sleeve-valve is made of a nitrided chromium-nickel-tungsten steel, similar to the German Flw 1440, and works inside the cylinder. This particular alloy was selected after considerable experimental work, since its coefficient of expansion approximates that of the light alloy cylinder barrel, thus giving the most favorable running conditions.

Piston Ring Materials

Piston ring materials of captured engines are listed in Table IV. In conformity with the chemical composition, the rings are not specially hardened. Formerly it was assumed, on the strength of some observations, that with nitrided liners, best running qualities were obtained with hardened piston rings of a fundamentally martensitic structure and a Brinell hardness of about 400. As the table shows, however, the hardness of the rings examined is well within normal limits, and the corresponding analyses reveal only relatively small additions of any hardening elements.

As far as the structure shows, heat treatment has only been used for the rings of the British engines, which have, in general, a transitional structure with modern martensitic constituents (that is, sorbitic basis). The high molybdenum percentage, around 0.5 per cent, in the rings of the Bristol Mercury

and the Armstrong Tiger, and the consistently very low phosphorus content, deserve special notice.

For the manufacture of piston rings, the French use mainly multiple sand castings, and British and American manufacturers favor individual sand or centrifugal castings.

Inlet Valves

The materials of the inlet and exhaust valves in the captured engines are very similar to German materials, although it can again be noticed that the alloy content of the steels is higher than is indicated necessary by German experience for the stress involved. The materials for the inlet valves are shown in Table V and again point out the tendency to standardization in each country, irrespective of engine design. The British use a steel with a chromium and nickel content of 12 to 14 per cent each, and about 2.5 per cent tungsten, corresponding to the German 1440 grade, now used by Germany only for exhaust valves. The inlet valves of the Wright Cyclone also use a high alloy, chromium-nickel steel, but without the addition of tungsten. Pratt & Whitney, on the other hand, in the Twin-Wasp engine uses a chromium-tungsten steel containing about 13 per cent tungsten, which is already familiar from the Pratt & Whitney Hornet engine. The French content themselves with a

TABLE III Cylinder Liner Materials of Captured Engines

Make of Engine	Chemical Composition, Per Cent									Surface Condition	Liner Hardness, Kg. Per Sq. mm.	Core Strength, Lb. Per Sq. In.
	C	Si	Mn	Cr	Ni	Mo	V	Al				
Rolls-Royce Merlin II & X	0.61	0.18	0.81	0	0.1	0.1	...	...	Not hardened	...	163,567	
Hispano-Suiza 12 Y crs	0.42	0.22	0.56	1.64	0.31	0.20	...	0.58	Nitrided to 0.0197 in.	875	~135,121	
Gnome-Rhone 14 N 2/3	0.22	0.25	0.40	2.94	Tr.	0.30	...	...	Nitrided to 0.0039 in.	880	156,455	
Pratt & Whitney Twin Wasp	0.43	0.24	0.90	1.01	...	0.27	...	...	Not hardened	...	145,077	
Armstrong Siddeley Tiger VIII	0.53	0.29	0.73	0.03	0.08	Tr.	...	...	Not hardened	...	106,674	
Gnome-Rhone 14 M 6	0.28	...	...	3.2	0.32	0.6	0.09	...	Nitrided	670	149,344	
Wright-Cyclone G 102 A	0.58	0.28	0.59	1.63	Tr.	0.43	...	1.05	Nitrided to 0.0118 in.	890	113,786	
Bristol Mercury VIII	0.23	0.26	0.63	2.99	0.44	0	...	...	Nitrided to 0.0118 in.	725	113,786	

TABLE IV Piston Ring Materials of Captured Engines

Make of Engine	Chemical Composition, Per Cent								Hardness, Lb. Per Sq. In.
	C	Si	Mn	Cr	Ni	P	S	Mo	
Rolls-Royce Merlin II	3.50	2.16	1.20	0.42	...	0.45	...	...	320,022
Hispano-Suiza 12 Y crs	3.70 2.90	3.02 2.22	0.63 0.90	<0.1 <0.1	<0.1 <0.1	0.33 0.24	...	...	334,246
Armstrong-Siddeley Tiger VIII	3.44	2.08	0.95	0.13	0.68	0.54	0.016	0.50	398,250
Gnome-Rhone 14 M 6	2.78	2.63	0.80	0.09	0.11	0.30	0.062	...	312,911
Wright Cyclone G 102 A	3.80	2.76	0.67	0.02	0.06	0.53	0.040	...	320,022
Bristol Mercury VIII	3.56	2.18	0.80	0.34	0.45	0.27	0.022	0.56	391,139

chromium-silicon steel, which in the Gnome-Rhone engines also contains some nickel.

Even for the inlet valves there are many variations in design features. Merlin, Twin-Wasp and Cyclone have solid valves; Bristol and Gnome-Rhone have a hollow stem in their valves; and the valves of the Hispano-Suiza have a hollow head. In the Hispano-Suiza, contrary to all others, the valve seat on the head is covered with stellite. Nitrided valve stems are in use on the Bristol Mercury and the Hispano-Suiza engines.

Exhaust Valves

The chemical composition and design features of the exhaust valves are given in Table VI. The British and American engines use a steel equivalent to the German Flw 1440. In the Hispano-Suiza engine, a chromium-silicon steel is used also for the exhaust valves, but with the addition of about 1 per cent molybdenum to increase strength at high temperatures. The Gnome-Rhone engines use a high alloy, chromium-nickel steel with about 28 per cent chromium and 22 to 24 per cent nickel without other additions. The addition of about 0.6 per cent cobalt to the steel is used in the Bristol Mercury.

All the engines have hollow exhaust valve stems, and the Hispano-Suiza, Pratt & Whitney, and Wright engines also have hollow heads. The head seats are stellited in all except the Merlin, the deposit having the same composition and hardness as in German engines. The

Merlin exhaust valve head seat is treated with "Brihtray," composed of about 80 per cent nickel and 20 per cent chromium. In the Merlin and Mercury engines the surface of the valve on the combustion chamber side is also protected with "Brihtray" to prevent burning and scaling.

Nitrided valve stems are used by Hispano-Suiza, Bristol and Wright. The nitration depth varies from 0.0003937 to 0.001968 in. The following methods, agreeing with German practice, are used to prevent wear at the tip of the valve stem: (1) Insertion of a compression member of case hardened steel; (2) insertion of a compression member of tool steel; and (3) hard metal deposit by welding.

An exception is provided by the Hispano-Suiza engine, in which the cam operates the valve stem directly instead of through a rocker-arm. The valve stem is therefore fitted with a cam-plate which is screwed into the valve stem and locked by a serrated rim engaging with corresponding teeth on the spring collar.

With the exception of the Merlin, Twin-Wasp, Mercury and Tiger engines, the inlet valve seat inserts are made of aluminum bronze with about 4 to 5.5 per cent nickel. In agreement with German practice, the Merlin and Twin-Wasp inserts are of standard aluminum bronze, equivalent to the German standard Flw 2321. The Mercury and Tiger use austenitic chromium-nickel-molybdenum, or chromium-nickel-manganese steels.

All exhaust valve seat inserts except those of the Hispano-Suiza are of a high nickel, chromium, or chromium-nickel steel. In the Hispano, the exhaust valve seat is of aluminum-bronze containing some nickel. Only the Gnome-Rhone and Bristol Mercury use stellite or "Brihtray" coating on the seat inserts.

The valve guides are usually of high tin-bronze, to which nickel is added in the Cyclone. French engine builders use 5 per cent tin-bronze only on the Gnome-Rhone engines, and cast iron guides on the Hispano-Suiza. This cast iron has a pearlitic base with a small percentage of ferrite and shows marked enclosures of phosphite eutectic, together with a graphite pattern of needle shape. A cast iron of similar structure with about 230 Brinell hardness is used for the exhaust guides in the Merlin II.

Valve Springs

With regard to the valve spring materials, English, French and American engine builders again show considerable diversity, as shown in Table VII. Whereas up to the present time, oil hardened carbon steel springs are standard German practice, the captured engines show every type of spring steel except oil hardened material. Merlin, Cyclone and Twin-Wasp have chromium-vanadium steel springs, similar to those used originally on the Pratt & Whitney Hornet, built under license in Germany. All the French engines use

a chromium-silicon steel, which is now being introduced into German practice. Only the Bristol Mercury has carbon steel springs, cold drawn by the Patentier process to a strength of about 227,572 lb. per sq. in.

In no case does the surface finish of the springs approach German standards. In the French engines, the springs are not even burnished. Shot blasting was found to be used only on the springs of the Cyclone. It must, therefore, be assumed that the spring loads have been kept lower than in German practice, either by engine design or by modifying the design of the springs themselves. Of course, this leaves out of account the possible extent to which difficulties have been encountered with valve springs on French, English and American engines. Recent information indicates that the cold drawn springs of the Bristol Mercury engine have frequently broken. Acceptance tests for the springs have been made considerably more stringent, and the manufacturer has resorted to surface grinding. The new acceptance conditions require 10 per cent of the springs made out of one batch of wire to be fatigue tested. If more than 5 per cent breakage is found, the whole batch is refused. German standards of acceptance have evidently found imitators.

Gears

A number of gear wheels from the main and auxiliary drives of several captured engines were examined. Case hardened gears predominate and consequently chromium-nickel or nickel case hardening steels, free from molybdenum are mainly employed. Nitrided steels containing aluminum are used only where grinding of the flanks of the teeth would be difficult; for example, on internal teeth. If nickel case hardening steels are used, the usual alloy is 5 per cent nickel for highly stressed gears, and 1.7 per cent for moderate stresses. Such gears are usually heat treated to about 170,600 lb. per sq. in. The chromium-nickel steel employed is similar to the former German ECN 45 steel, but with the percentage of nickel at the lower and the percentage of carbon at the higher limit allowed by this former German specification. For highly stressed gears, a chromium-nickel-molybdenum is also used, corresponding to the German Flw 1409 specification. These two alloys are heat treated to 170,679 to 199,125 lb. per sq. in. The case hardening depth, 0.03149 to 0.05118 in., is greater than in German practice. The gears have a surface hardness between 590 and 620 kg. per sq. mm., corresponding to 60 to 62 Rockwell C.

The tooth flanks are generally ground, and this applies particularly to case hardened power transmitting gears. However, the finish leaves much to be desired. The very small radius at the transition from flank to bottom of the tooth in the Twin-Wasp gears may be observed, as well as the absence of grinding at the bottom of the tool, resulting in a burr being left in that region. Similar rough finish at the bottom will be observed in the ground gears of the Merlin X auxiliary drive. Rough workmanship may be found in some cases at the base of the thread of the heavily stressed crankcase assembly and cylinder holding down bolts of a Twin-Wasp engine. It is, of course, difficult to state whether these examples are exceptions which escaped inspection, or whether better workmanship was not specified.

Bearing Materials

As to the bearing materials used in the captured engines, it must be remarked in the first instance that in all cases the crank-pins have plain lubricated bearings. It will be observed in Table VIII that almost every engine uses a different bearing composition. Of greater interest with respect to materials and design are the connecting-rod bearings of the two liquid cooled engines, the Merlin and the Hispano-

TABLE V Materials of Inlet Valve Heads of Captured Engines

Make of Engine	Chemical Composition, Per Cent								Type of Valve	Treatment		
	C	Si	Mn	Cr	Ni	Mo	W	Co		Seat	Head	Stem
Rolls-Royce Merlin II	0.42	1.46	0.75	13.8	14.25	0.1	2.68	...	Solid	Not treated	...	...
Hispano-Suiza 12 Y crs	0.40	2.51	0.59	10.35	0.1	...	...	...	Hollow head	...	...	Nitrided
Gnome-Rhone 14 N 2/3	0.31	0.42	0.58	12.98	4.32	...	...	...	Hollow stem	Not treated	...	...
Pratt & Whitney Twin-Wasp	0.62	0.34	0.27	3.65	...	0.11	12.54	...	Not Cooled	Not treated	...	...
Armstrong-Siddeley Tiger VIII	0.46	1.92	1.85	13.80	13.20	...	2.58	...	...	...	...	...
Gnome-Rhone 14 M 6	0.27	0.2	...	15.	1.0	...	...	...	Hollow stem	Not treated	...	...
Wright Cyclone G 102 A	0.30	1.78	...	12.45	8.01	...	...	...	Solid	Not treated	...	...
Bristol Mercury VIII	0.48	1.35	0.65	11.55	14.14	...	2.26	...	Hollow stem	Not treated	...	Nitrided

TABLE VI Materials of Exhaust Valve Heads of Captured Engines

Make of Engine	Chemical Composition, Per Cent									Type of Valve	Treatment of		
	C	Si	Mn	Cr	Ni	Mo	W	Co	Seat	Head	Stem		
Rolls-Royce Merlin II	0.41	1.44	0.72	16.3	14.3	0.10	2.95	0.2V	Hollow stem	Brightray	Brightray	.....
Hispano-Suiza 12 Y crs	0.40	2.51	0.59	10.35	0.1	1.08	....	....	Hollow head	.....	.....	Nitrided
Gnome-Rhone 14 N 2/3	0.13	0.81	....	17.99	22.94	0.20	....	....	Hollow stem	Stellite	.....	.....
Pratt & Whitney Twin Wasp	0.49	0.51	0.50	13.76	13.84	0.29	2.11	....	Hollow head	Stellite	Not treated	.....
Armstrong-Siddeley Tiger VIII	0.48	1.54	....	13.60	17.70	....	1.84	....	.....	.....	.....	.....
Gnome-Rhone 14 M 6	0.18	....	....	17.0	24.1	....	....	....	Hollow stem	Stellite	.....	.....
Wright Cyclone G 102 A	0.47	1.34	....	12.45	14.77	....	2.47	....	Hollow head	.....	.....	Nitrided
Bristol Mercury VIII	0.50	1.65	0.70	13.66	13.55	Trace	2.74	0.59	Hollow stem	Stellite	Brightray	Nitrided	

TABLE VII Valve Spring Materials of Captured Engines

Make of Engine	Type of Spring	Chemical Composition, Per Cent							Core Strength, Lb. Per Sq. In.	Wire Diameter, In.	Remarks
		C	Si	Mn	Cr	Ni	V	Mo			
Rolls-Royce Merlin II	Outer	0.42	0.21	0.74	1.38	....	0.21	....	206,237	0.173	No surface hardening No surface protection, lightly ground
	Inner	0.43	0.21	0.74	1.26	....	0.20	....	206,237	0.122	
Hispano-Suiza 12 Y crs	Outer	0.61	1.29	0.71	0.64	Trace	....	....	233,261	0.165	No surface hardening No surface protection
	Inner	0.59	1.40	0.68	0.80	0.23	....	....	213,389	....
Gnome-Rhone 14 N 2/3	Outer	0.60	1.37	0.60	0.62	Trace	....	....	....	0.236	No surface hardening No surface protection
	Middle	0.60	1.38	0.65	0.62	0.10	....	....	....	0.177	
Pratt & Whitney Twin Wasp	Inner	0.60	1.39	0.60	0.62	0.08	....	....	....	0.126	No surface treatment or protection against corrosion
	.....	0.55	0.25	0.67	0.95	....	0.22	0.04	192,013	....
Gnome-Rhone 14 M 6	Outer	0.64	1.43	0.77	0.78	....	....	0.09	237,528	0.252	No surface hardening, baked enamel treatment
	Inner	....	....	....	....	....	....	....	216,193	0.181	
Wright Cyclone G 102 A	Outer	....	....	....	....	....	....	....	194,858-201,970	....	Shot-blasted and cadmium plated
	Middle	....	....	....	....	....	....	....	219,038-227,572	....
Bristol Mercury VIII	Inner	....	....	....	....	....	....	....	194,858-201,970	....	....
	Outer	0.77	0.56	0.63	....	....	....	....	....	0.177	Cold drawn by "Patent-iert" process, no surface or protection
	Middle	0.76	0.49	0.59	....	....	....	....	230,416	0.138	
	Inner	0.80	0.46	0.56	....	....	....	....	....	0.098	

TABLE VIII Connecting Rod (Big End) Bearing Metals of Captured Engines

Type of Engine	Bearing	Chemical Composition, Per Cent										Hardness, Brinell
		Cu	Pb	Fe	Ca	Al	Ag	Sn	Cd	Ni	.....
Rolls-Royce Merlin II	Outer	74.6	23.6	1.0	0.1	0.2	....	0.8	....	....	....	53
	Inner	70.5	27.8	0.8	0.1	0.2	....	0.9	....	....	....	46
Hispano-Suiza 12 Y crs	Outer	74.9	14.9	0.33	....	....	....	10.0	....	....	....	71
	Inner	74.7	22.3	0.68	....	....	....	....	....	....	....	....
Gnome-Rhone 14 M 6	....	....	....	....	....	....	....	....	....	....	....	....
Wright Cyclone G 102 A	....	70.6	27.7	0.6	....	....	....	0.7	....	....	....	....
Bristol Mercury VIII	....	....	....	....	....	....	....	....	....	98.0	2.0	....

Suiza. In the Merlin II, the lead-bronze in which the crankpin works is directly cast into the big end of the master connecting rod, for which purpose the latter is made in three parts, as already described. In the Merlin II, the two bearing caps are covered both on the inside and outside with lead-bronze. The 5 per cent nickel case hardening steel of which the caps formerly were made becomes hardened by the casting and subsequent quenching of the bush, and the surface layer carrying the bronze is likely to crack. Cracks at the junction surface have, in fact, been found by metallographical examination, but to no greater extent than in the standard German carbon steel bearing shells. In the German bearings, cracks of such dimensions are considered harmless. The lead-bronze for the interior and exterior bushes has about 24 to 28 per cent lead, with 0.8 to 1 per cent tin added for hardness, which runs about 45 to 55 Brinell.

As already mentioned, the Merlin X engine has steel liners to both master and auxiliary rod bearings made of a case hardening steel with 2.5 per cent nickel. These are bushed with a lead-bronze of 24 per cent lead and 2 per cent tin in the master rod, and a ternary bronze of 18 per cent lead and 9 per cent tin in the auxiliary rod. The hardness is 45 and 55 Brinell respectively.

Thus, in the development from the Merlin II to the Merlin X, both the design and the material of the bearing have been altered, since the inserts are made of a different steel from the original bearing caps. It appears that even this solution is not final for the crankpin bearing, since, according to the technical press, Rolls Royce is making further experiments with a light alloy bearing metal consisting mainly of aluminum with an addition of tin.

The crank case (journal) bearings of the Merlin engine are fitted with the usual steel liners bushed with a soft lead-bronze of about 35 Brinell. An addition of 0.6 per cent silver has been noticed.

The main bearings of the Hispano-Suiza engine are lined with a white metal alloy containing about 85 per cent tin, 7 per cent copper, and 8 per cent antimony, resembling the alloy formerly used in Germany. The connecting rod bearings, on the other hand, are fitted with steel shells, lined in-

ternally with a soft alloy and externally with a hard alloy. The same problem of bushing on two sides with different alloys exists in the German Jumo 211 engine, and has not yet been satisfactorily solved in Germany. There is one possible process in existence, which is, however, impracticable for economic reasons. In the Hispano-Suiza engine, the inner lining consists of a 22 per cent lead-bronze, and also contains about 1.1 per cent of silver. An addition of silver has already been noted in the main bearings of the Merlin.

The outer lining of the connecting rod bearing shell is a ternary bronze with 10 per cent tin and 15 per cent lead, with a hardness of about 70 Brinell. The Hispano-Suiza casting process for two-sided bearings with different hardness characteristic is generally as follows:

Cylindrical bushes are cast in well dried cement molds and machined to external or internal press fit on the finished steel liner. The bushes are then inserted in a special mold made of welded sheet metal, containing the liner at the center. The whole is heated in a high-frequency electric induction furnace of special design, with provision for a protective gas atmosphere, suitable arrangements for pressing the bushes on to the liner and subsequent quenching being provided. The two liners are thus remelted in place. This process is far more complicated than the usual methods of casting bearing liners, but furnishes very accurate and uniform work, particularly important in bearings of this type. The process was developed by the engine builders themselves, presumably because French bearing manufacturers were unable to meet these requirements.

Of the radial engines captured, the Gnome-Rhone and the Bristol use a cadmium alloy for the big end bearing hardened with a 1 to 2 per cent nickel. While the Bristol bearing has a floating shell lined on both sides, the Gnome-Rhone used fixed steel shells, bushed internally only. The Wright Cyclone, on the other hand, in conformity with German practice, uses a binary lead-bronze with about 28 per cent lead and 0.7 per cent silver, cast on a shell fitted in the master rod.

Light Alloys Used

The following light alloys were used in the engines examined: Cast

alloys—the sub-eutectic, silumin gamma type and aluminum-copper-nickel alloys; wrought alloys—exclusively Y and RR (aluminum-copper-nickel). Contrary to German practice, the pistons of all captured engines are of Y or RR alloy, cast or wrought.

In the Hispano-Suiza liquid cooled engine, crank case and cylinder blocks are of sub-eutectic silumin gamma alloy with an addition of cobalt. Apparently there was as yet no shortage of cobalt in France, and thus no inducement to substitute manganese. It is noteworthy that the standard French alloy has a low iron content, and a smaller percentage of magnesium (about 0.2 per cent) than is customary in Germany at this time. As has since been confirmed by German test, the reduction in magnesium and iron content improves the ductility of the casting without a material reduction in ultimate tensile strength. Increased ductility leads to a better equalization of stress peaks, an advantage also recognized by German plane builders. As a result, similar alloys have been introduced lately into German practice.

The British in-line engines, contrary to corresponding French and German practice, use a cast alloy RR 54, containing copper and nickel, for crank cases and cylinder blocks. The tensile strength of this alloy at ordinary temperature is somewhat below the silumin gamma alloys, but at higher temperatures the Rolls-Royce alloy is probably stronger. The exceedingly fine grain of the material of the castings deserves special attention.

The crank cases of the Bristol and Gnome-Rhone radial engines are forged from an RR 56 alloy, whereas the American radial Twin-Wasp uses a cast aluminum-magnesium-silicon alloy with about 1 per cent silicon and 0.6 per cent magnesium. This is contrary to German practice. An addition of about 0.25 per cent cobalt may be noted, the object probably being to reduce creep. The Wright Cyclone has a crankcase made of a low percentage chromium-nickel-molybdenum steel heat treated to about 113,786 lb. per sq. in.

For the cylinder heads of radial engines, the Y alloy predominates. While French and American engines have cast heads, the Bristol Mercury uses forgings.

Floating Motor Drives

A FEATURE of considerable interest at the new Alcoa, Tenn., plant of Aluminum Co. of America is the widespread use of "floating motor drive" on the front and back tables of its breakdown mills and on the hot run-out tables. The new drive, developed by Reliance Electric & Engineering Co., Cleveland, is also in use at various spots in the steel and brass industries, replacing the line shaft, gear-motor or direct-coupled motor drives conventionally used.

This new development is an effort to consolidate mechanical and electrical designs for roller tables by making the rotor of the motor an integral part of the roller, eliminating mis-alinement, which has always been a problem.

The motor shaft fits tightly over the shaft extension of the roller. It is keyed in place and the two shafts are connected by a stud that runs through the hollow motor shaft and engages thread in the roller shaft. Even should the roller become warped, the motor will still drive it. The weight of the motor on the roller is much less than the strain that would be imposed on the same shaft by recommended belt pull, according to Reliance engineers. The motor rotor and the roller are carried on the same set of bearings. Two coil springs attached to a lug in the rear of the motor and anchored to the table bed prevent rotation of the stator when power is applied and serve to cushion starting of the motor.

When the screw connecting the rotor sleeve and the roller shaft extension is turned, the rotor sleeve is forced off the shaft extension, the whole motor being carried with it. Mounting the motor on the roller shaft extension is equally simple.

The motor, of course, must run at the same speed as the driven shaft, a new departure in mill operating practice for outside driven rollers. Generally speaking, roller shafts must be larger. Simplified table construction is permitted, however, as supports are needed only for pillow block bearings, eliminating elaborate cross framing, especially in tube mills where rollers are spaced on long centers.

There are 630 direct drive a.c. motors on the front and back tables

THE "floating motor drive", developed by Reliance Electric & Engineering Co. for the new Alcoa, Tenn., plant of the Aluminum Co. of America, combines mechanical and electrical elements in making the rotor of the motor an integral part of each roller.

of the breakdown mills and at the shears. Rolls are 120 in. wide on the breakdown mills, and floating drive motors are installed on both ends of each roll.

The first breakdown mill is a fast reversing drive unit and can be reversed as quickly as 10 times per min. Instead of a turntable, slabs are turned on two sets of half rollers, each roller being 56 in. wide. In practice, one set of rollers revolves while the other set remains stationary, and the slab thus is turned. On the hot run-out table where the hollow steel rolls are 80 in. wide, there are 163 of the new type a.c. motors.

While the cost of floating drive motors is somewhat greater than the cost of a standard motor, there are a number of savings enabled which help make up the difference. The coupling and the cost of its mounting are eliminated, and the structure supporting the mill tables can be simple. Maintenance costs are reduced, due both to the fact

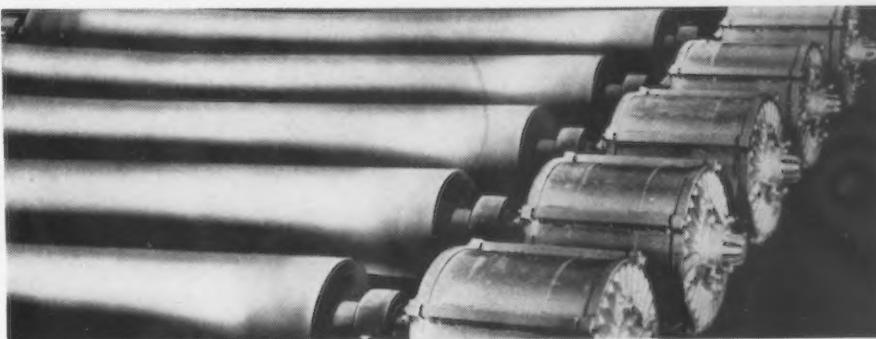


that mis-alinement is eliminated and easy removal of motor and roller is provided.

This new kind of drive has already been developed in capacities sufficient to handle small tube or merchant mill conveyors, as well as plate mill tables. Ample torque, tailored to the job, provides rapid acceleration and deceleration for large or small rolls. The torque required is literally built into the floating motor drive.

So far the development has been confined to replacing direct-connected motors by floating motor drive. Some design work has gone forward with a view to producing a unit which would replace geared head motors. Since the motor speed would then be different from the roller speed, the geared head would be supported from a roller extension, and the motor, in turn, supported from the geared head. It is expected that much experimentation will be necessary due to the complicated problems involved.

FOR additional ventilation on some of the "floating motor drives," auxiliary blowers are added to the motor assembly, as shown here. These operate independently of the motor speed and are driven by $\frac{1}{4}$ -hp. fully enclosed motors. By this means there is continuous cooling provided even though the roller may be operated at very slow speed or be reversed frequently.



Recommended Tolerances for Gears

INTENDED to form a practical basis upon which gears can be manufactured, inspected, sold or purchased, a tentative recommended practice on inspection and tolerances for gears is being promulgated by the American Gear Manufacturers Association and is abstracted here. The practice was first adopted in May, 1940, and revised in October, 1941.

While specific figures are given in the accompanying table, it is emphasized that ultimate performance is the final criterion in the acceptance or rejection of gears, regardless of whether they meet definite tolerances. However, when gears fail to perform satisfactorily, definite inspection methods and tolerances are invaluable in locating the cause of noise, wear or failure.

An important consideration is the relation of cost to accuracy. In some instances, stipulation of the closest tolerances may result in a gear costing several times more than it need cost to meet service requirements.

Tolerances for backlash are not included in the table because of the separate AGMA standard adopted for spur gears. Tooth thickness

and pitch diameter measurements are related to backlash and are likewise omitted. Tolerances for tooth surface finish and for quietness are considered beyond the scope of this recommended practice. Tolerances for combined error tests of various sorts are omitted for simplicity, although their value for routine checks is recognized.

Runout

Runout of a gear is the total difference between high and low readings of a dial indicator suitably arranged to denote the off-center relation of the axis of the tooth profiles with respect to the axis about which the gear rotates. It is twice the eccentricity. It includes the effect of side runout or wobble. Runout may be measured by a dial indicator applied to the root diameter or to the outside diameter of the teeth if these portions have been milled or hobbed simultaneously with the tooth profiles, or it may be measured by observing or graphically recording the center distance variation when the gear is rotated in mesh with a master, excluding the effect of such variation caused

by profile errors, errors in spacing, interference, etc.

On wide face gears, the runout may vary appreciably across the face width and consequently should be measured near both faces. Appreciable difference in the two readings is an indication of wobble, which is more serious than uniform runout because it prevents contact across the entire face width.

Pitch Error

Pitch error of a gear is the maximum difference between any two successive tooth-to-tooth readings, converted to represent a measurement on the pitch circle between corresponding sides of adjacent teeth. Either set of profiles may be used for tooth-to-tooth readings, but preferably the driving sides if the gear operates in one direction only. It is preferable to take pitch error readings so that they are independent of runout, because runout is mainly a function of blank processing and set-up, whereas pitch errors are mainly a function of the gear cutting machine or cutter.

A plane of rotation has been selected.

(CONCLUDED ON PAGE 46)

A.G.M.A. Recommended Practice for Inspection and Tolerances—Spur and Helical Gears
(ALL READINGS IN TEN-THOUSANDTHS OF AN INCH)

Class	D. P.	Runout of P. D., Total Indicator Reading										Pitch Error Measured on Pitch Circle in Plane of Rotation										Accumulated Error Between Any Two Teeth Exclusive of Runout Effect										Profile Error, Exclusive of Tip Modification, Total Variation, Not Plus and Minus										Circumferential Lead Error Per Unit Width of Face	
		3/4	1 1/2	3	6	12	25	50	100	3/4	1 1/2	3	6	12	25	50	100	3/4	1 1/2	3	6	12	25	50	100	3/4	1 1/2	3	6	12	25	50	100	1 In.	6 In.								
Precision High Speed	4	...	...	10	10	12	14	...	...	...	3 1/2	4	4	4	...	...	...	...	10	10	12	20	...	...	...	5	5	5	5	...	...	3	6		
	8	...	...	10	10	10	12	14	16	...	...	2 1/2	2 1/2	3	3	3	3	3	...	10	10	10	12	20	30	...	...	4	4	4	4	4	4	2	4		
Over 2000 ft. per min.	16	...	10	10	10	10	12	14	16	...	2	2 1/2	2 1/2	2 1/2	3	3	3	3	...	10	10	10	10	12	20	30	...	3	3	3	3	3	3	3	2	4							
	32	10	10	10	10	10	12	...	...	2	2	2	2	2 1/2	2 1/2	...	...	10	10	10	10	12	...	...	3	3	3	3	3	3	...	2	4				
Commercial High Speed	2	...	...	20	20	25	25	30	...	...	5	5	5 1/2	6	6	...	...	...	20	20	27	43	70	...	...	11	11	11	11	11	11	...	4	8	
	4	...	10	20	20	25	25	30	...	...	3 1/2	3 1/2	4	4	5	5	5	...	15	15	15	21	33	53	...	...	8	8	8	8	8	8	...	4	7				
Up to 2000 ft. per min.	8	...	10	10	15	20	25	25	30	...	3 1/2	3 1/2	3 1/2	4	4	5	5	5	15	15	15	15	15	30	45	...	6	6	6	6	6	6	...	3	6								
	16	10	10	10	15	20	25	25	...	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4	15	15	15	15	15	15	24	...	5	5	5	5	5	5	...	3	6								
Commercial Medium Speed	32	10	10	10	15	20	25	...	...	2	2	2 1/2	2 1/2	3	3	3	3	3	15	15	15	15	15	15	15	...	5	5	5	5	5	5	...	3	6						
	1	...	...	30	35	40	45	...	...	...	25	35	45	60	...	...	...	...	...	...	...	...	...	...	...	30	35	40	40	...	...	6	11		
Up to 400 ft. per min.	2	...	...	20	20	25	30	35	...	...	10	15	20	25	30	...	...	...	...	...	...	...	...	...	20	20	25	30	30	...	5	10			
	4	...	20	20	20	25	30	35	...	...	5	6	7	8	9	10	...	...	...	...	...	...	...	...	10	10	11	12	12	12	...	5	9		
Low Speed	8	...	15	15	20	20	25	30	5	5 1/2	6	6 1/2	7	7	7	7	...	9	9	9	9	9	10	...	4	8	4	8							
	16	15	15	15	20	20	25	30	...	3 1/2	3 1/2	4	4	4 1/2	5	5 1/2	...	...	7	7	7	7	7	7	8	...	7	7	7	7	7	8	...	4	8						
Up to 80 ft. per min.	1	...	...	70	90	90	100	...	...	...	50	75	125	180	...	...	...	...	...	...	...	...	...	...	50	60	70	80	...	...	...	...	...	...			
	2	...	...	60	60	80	80	90	...	...	40	50	70	100	150	...	...	...	...	...	...	...	...	...	30	35	40	45	50	...	...	...	...	...				
Up to 80 ft. per min.	4	...	50	60	60	80	80	90	...	...	30	40	50	60	90	120	...	...	...	...	...	...	...	...	25	30	35	40	40	40	...	...	...	...					
	8	...	30	50	60	60	80	80	...	...	15	20	25	30	35	35	...	...	...	...	...	...	...	...	20	20	25	30	30	...	...	...	...	...				
Up to 80 ft. per min.	16	30	30	50	60	60	80	80	...	15	17	20	23	25	...	...	...	...	...	...	...	...	...	15	15	15	20	20	25	...	...	...	...	...				

Rebuilt Machine Tools Vital Today

BECAUSE of the unprecedented demand for metal working machinery in the defense program, rebuilt and guaranteed machine tools have assumed an importance second only to the vital machine tool industry itself. In fact, several of the rebuilders are now making new equipment as well, and like the prime producers, have found it necessary to expand their facilities to cope with the present situation. Illustrated on these pages are views taken in the new Fairfield plant of J. L. Lucas & Son, Inc., Bridgeport, typifying the job a

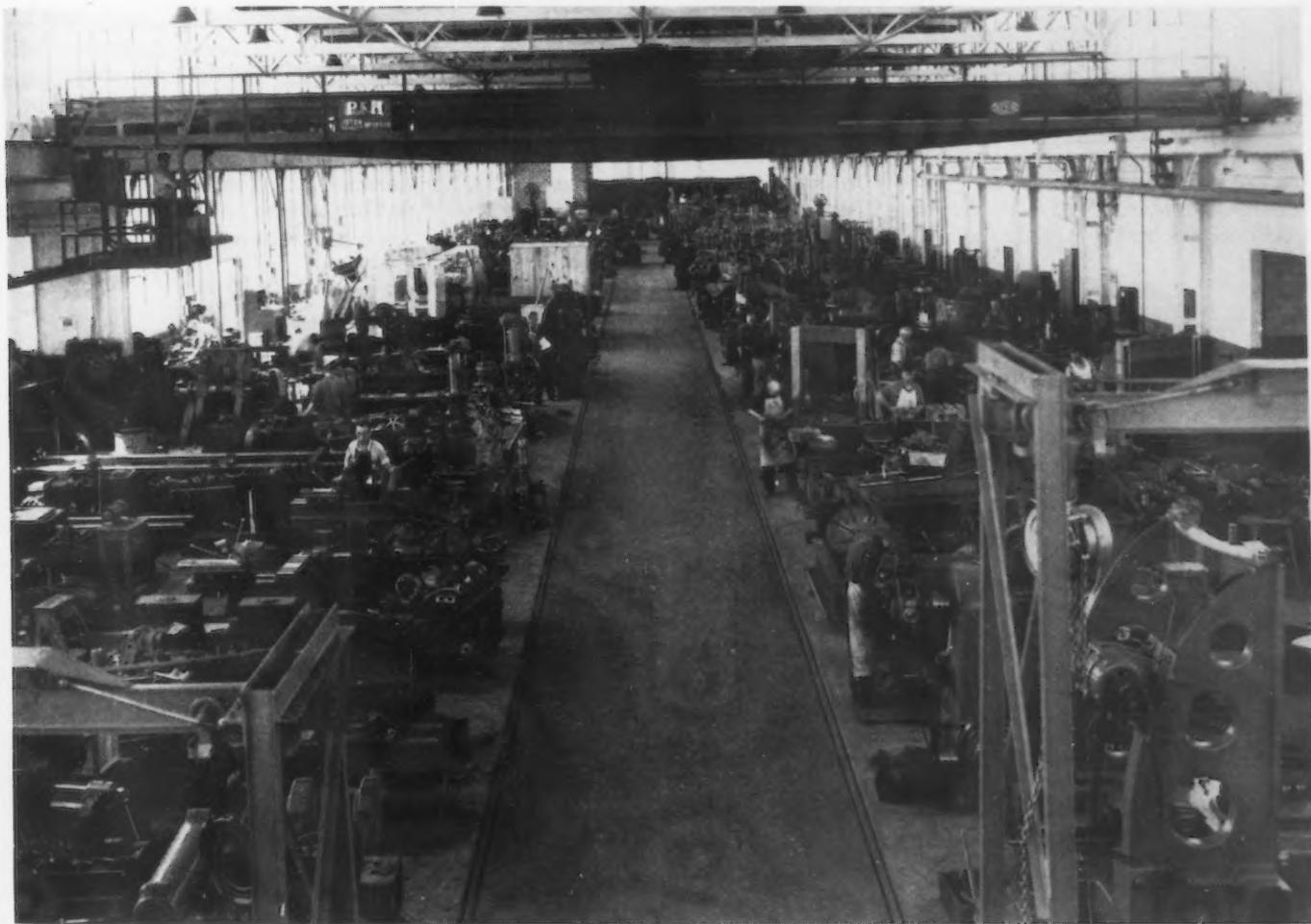
company of this kind is doing. These pictures indicate how used machine tools are completely rebuilt, tested under power and shipped with a guarantee of satisfactory performance.

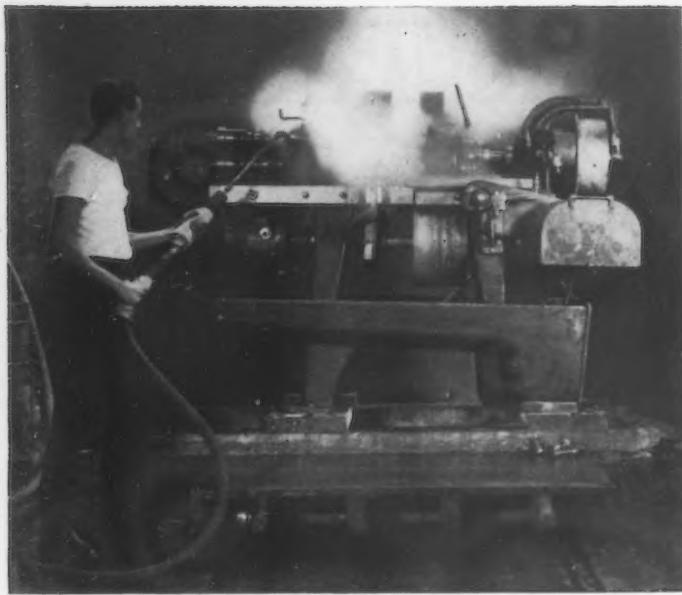
The Lucas firm was organized in 1903 largely for the purpose of supplying repair parts for Locomobile steam driven automobiles after the original maker had begun manufacturing gasoline driven cars. Later this business developed into one of supplying machinery for repairing steam automobiles and was built up on the basis of selling the

used machinery discarded from various plants in Bridgeport as new machinery came in to replace it. Putting this used machinery into first class condition started the rebuilding activity which has reached its peak today.

Rebuilt machine tools have taken an important place in speeding up defense work. By taking used machines that are not in active use, doing a conscientious job in refinishing worn surfaces and replacing worn and broken parts like gears, shafts and bearings, and perhaps modernizing the machine by adding

VIEW down the central aisle of the new Lucas plant. The windows have been treated to reduce glare. Besides the 10-ton overhead crane, there are two one-legged gantry cranes running along tracks on either side of the aisle. Two more are to be added. Machines are received and shipped from the rear on a depressed railroad siding within the building. Including the office, the new plant has about 45,000 sq. ft. of floor space, as compared with 26,500 sq. ft. in several buildings, poorly arranged.





ONE of the first jobs to be done on an old machine is to clean off the accumulated oil-soaked grit and grime with a steam hose before disassembly and more thorough cleaning.



COMPLETE disassembly is the next step in a rebuilding job. The castings are then given a prime coat of light gray to facilitate layout work in remanufacture.

a variable speed drive (since the range of speeds and feeds available in the older machines is usually quite limited), a machine can be turned out that is in as good running order as when new.

Generally machines are not rebuilt unless there is a customer for them. It takes several hundred hours to thoroughly rebuild the average machine tool. Some machines in good operating condition are not necessarily dismantled, but are tested under power belt. A few machines are resold strictly "as is."

Essentially, a shop of this kind resembles a jobbing machine shop in that an extremely wide variety of parts must be handled in small lots. Engine lathes, shapers, planers, drill presses and milling machines predominate. A number of precision jobs on big castings are handled in the horizontal boring mill. Many of these machines are also rebuilt types, although some new machine tools have been added in connection with the present expansion program, which represents a consolidation of several shops

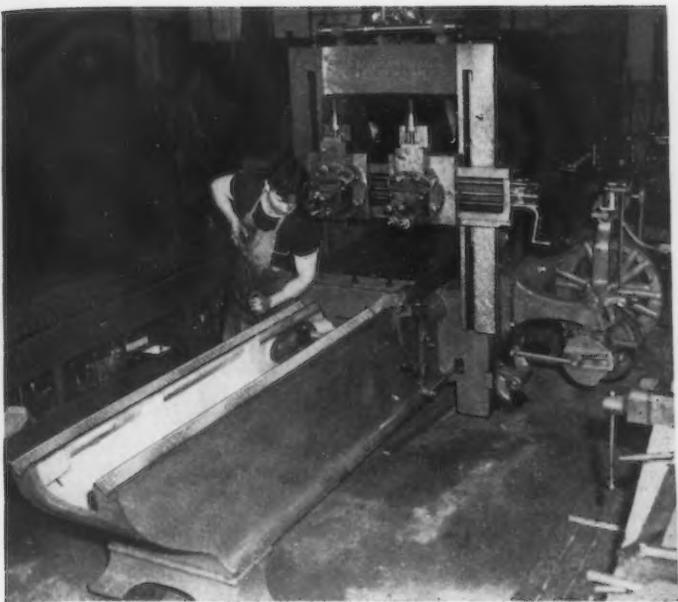
and a warehouse originally located in Bridgeport proper.

Working conditions are of the best. Unit heaters are used throughout to provide comfort in winter, there is excellent day and night illumination, and ample locker facilities with showers and fountain wash basins have been provided. At present the plant is working one full shift of 55 hr. per week, with a small shift working through the night.

More than usual attention has been given to material handling fa-



ONE of the special defense jobs Lucas was called upon to do was to modernize a group of 32 double-spindle gun barrel drillers, including the application of individual motor drive to each spindle.



RIGHT

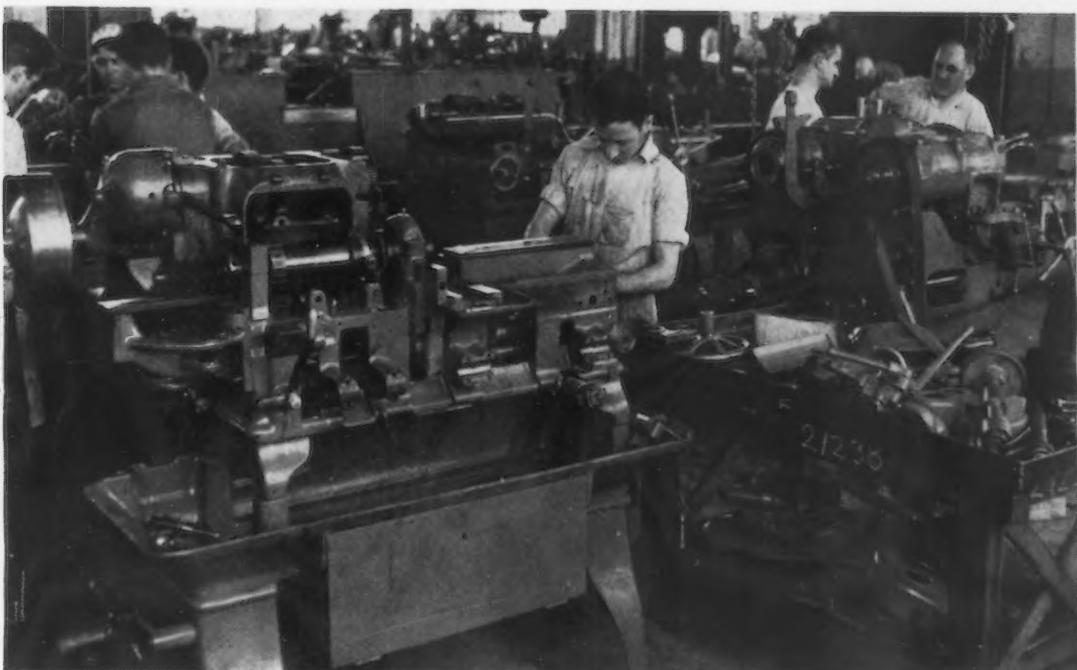
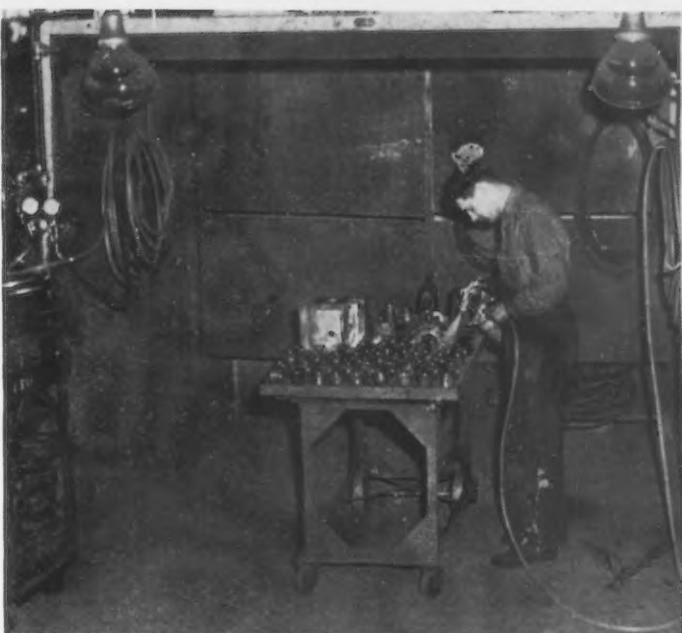
SMALL parts are painted in a spray booth. Large bed castings are also spray painted, filled and sanded down before a finish coat is applied.

• • •

BELOW

REASSEMBLING, scraping and refitting are skilled jobs, carried on in a separate department. One of the wheeled benches with all the small component parts on it can be seen at the right. The original parts have been either replaced or repaired. The rebuilt machine must meet the standards of accuracy of equivalent new machines. Testing under power is the final proof that the job has been well done.

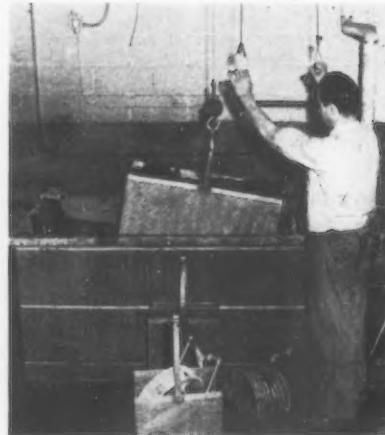
PLANER beds and tables are remachined, then scraped to a good fit. In rebuilding lathes, also, the bed V's are invariably planed and saddles and tailstocks refitted. This procedure necessitates dropping of the spindle center and involves modifying some of the gears in the headstock to take account of changed center distances.





cilities. A railroad siding extends through the far end of the building and the tracks are sunk so as to bring the car floor flush with the shop floor. Truck deliveries are handled in a similar manner. Machines are moved as a unit by overhead crane. Unit subassemblies are handled by two (soon to be increased to four) one-leg gantry cranes with chain hoists. Floor and wall tracks for the gantries run the length of the shop. In addition there are two storage battery industrial trucks for handling tote boxes, crates, motors, etc., on skids. There are also wheeled tables with flanged tops for component parts. They follow the machine through the entire rebuilding process.

The plant is roughly divided into the receiving and shipping section mentioned, welding department, machine and motor storage (in the "as is" condition) heavy machine



Small parts are loaded in baskets and dipped into a hot cleaning bath (1000 lb. Oakite in 2500 lb. of hot water) which removes everything down to the bare metal.

Recommended Tolerances for Gears

(CONCLUDED FROM PAGE 42)

lected as the plane of measurement because diametrical pitch has been arbitrarily selected as the basis for establishing tolerances. With helical gears of high angle, because of the cramping effect of the teeth, readings may be taken in a plane normal to the helix angle and converted to the plane of rotation by dividing the readings by the cosine of the helix angle.

Accumulated error of a gear is the maximum accumulation of pitch errors obtained by algebraic addition of tooth-to-tooth pitch errors after they have been corrected with reference to the true pitch. The largest plus value reached in a series is then added to the highest minus value to obtain the accumulated error. Unless otherwise specified, accumulated error is checked over the entire 360 deg.

Accumulated error may be derived for any gear for which tooth-to-tooth readings are available, al-

though it is a tedious job. However, an occasional check to see that the gear cutting machine is cutting within the accumulated error tolerance is usually all that is necessary.

Profile error of a gear tooth is the difference between the highest and lowest readings of a dial indicator moving along the true involute curve in the plane of rotation and having a finger contacting the active tooth profile. At high helix angles, false readings may sometimes be given by the cramping effect of the helical teeth. Some involute checkers have provision to take readings in a plane normal to the tooth, in which case the readings are converted to the plane of rotation by dividing by the cosine of the helix angle. A considerable error in pressure angle may be accepted on a gear provided the same error is present in the mating pinion.

Lead error of a helical gear is ex-

assembly and disassembly, machine shop, light machine assembly, scraping and fitting department, small parts storage, electrical maintenance, woodworking and boxing departments. A lot of standard castings, both bronze and cast iron, as well as V-belts and sheaves are stocked. Incidentally, if a special casting has to be made, the old casting is used as the pattern. Electric motor repairs are contracted for through a local repair service.

The photographs trace the various steps in rebuilding, beginning with cleaning and disassembly and ending with final run-in and test under power, which last is not shown, however. Since a large portion of rebuilt machine tools go into foreign trade, at present chiefly through lend-lease channels, a sizable crating and boxing department has been set up.

pressed as the circumferential tooth error per unit of gear face. It may be measured by traversing an indicator along a tooth parallel to the axis while the gear rotates in a timed relation according to the helix angle. Readings are taken in a plane normal to the helix angle to avoid side cramping and are converted to the plane of rotation by dividing by the cosine of the helix angle.

The higher the helix angle, the more closely the axial lead error must be held to have satisfactory tooth contact between gears, a condition frequently overlooked in considering lead errors. Lead errors are greatly influenced by runout and therefore the gear must be mounted perfectly true for testing. A considerable error in lead may be acceptable provided the same uniform error is present on the mating pinion.

How to Operate Seven Days Per Week

MOST plants with any portion of their business involved in war work are operating three shifts, six days a week. Notwithstanding this, unfilled orders are piling up. Getting out more production is America's No. 1 problem. Although plants here are committed to a 40-hr. week before the payment of overtime, Hitler's Germany is operating on a 72-hr. basis.

There are about four ways to secure more production, as follows:

- (1) Enlarge the plant and install more machine tools.
- (2) Farm out or sub-contract more work.
- (3) Introduce more efficient production methods.
- (4) Operate the plant more hours.

Machine tools are very difficult to get, and even with a favorable preference rating, exceedingly long deliveries are the rule with any of the popular tools. Subcontracting work is not always possible notwithstanding the strenuous efforts being made to promote this by the OPM. Machine tool capacity of the type many plants are short of is often not available elsewhere. The smaller shops are not familiar or experienced with a particular type of work, and costs of the subcontractor are often so out of line as to be impracticable.

A very effective way of increasing production is through methods, studies and the introduction of proper wage incentive systems. This has been responsible for increasing production from 30 to 50 per cent above what it was be-

—All-out war effort requires that full use be made of plants and machine tools not only by operating 24 hr. per day but also by running 7 days per week. Seven-day operation introduces the many problems described and analyzed herein.

◦ ◦ ◦

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fore the studies were made. However, such a program usually requires a considerable period before tangible results are accomplished. This method of increasing production is beyond the limits of this article.

The only route easily available to the manufacturer, therefore, is the operation of the plant 24 hr. per day and 7 days a week. Working the seventh day offers many problems. Some industries and processes are such that the seventh day is required for oiling and maintenance. When this obstacle cannot be overcome in some other way, these industries, of course, cannot operate more than 6 days a week.

Since labor relations have become so fragile, it is extremely important that the plan of 7-day operation be well worked out to suit the particular conditions involved for each individual company. Overtime policies seriously affect the

kind of 7-day-a-week plan that can be put in.

A company is particularly fortunate if overtime must be paid only after 40 hr. work without regard to work on any particular days. But most companies have already established the policy that work on Saturday (regardless of how much time was previously put in during the week) is compensated for at time and a half and Sunday calls for double time. This offers handicaps in working out a plan.

At the start of 7-day operations, a firm is particularly fortunate if it has only been working 5 days per week. But alas, few companies jump from 5 to 7 days. Before 7-day operation becomes evident as being desirable, the plant has probably been working 6 days a week for some time.

A well thought-out plan for 7-day operation will require a minimum of new men to be found and trained,

will necessitate few if any men to operate more than one machine and if any such *are* required, the fewer different machines that must be operated (on different days) by the same man, the better.

The ideal plan will give every man the same break as nearly as possible, that is to say, one man should not be required to work longer hours for the same pay than another man (when overtime for Saturday and Sunday are considered), and each should have the same break as to getting off Sunday as nearly as possible. Pay should be uniform as between pay periods if practical.

There should be no transfer from one shift to another on different days if that can be avoided. Where shifts rotate or transfer from one to another, there should be at least 24 hr. from the starting on one day and the next; in other words, there should be no short lay-offs. Ample periods of rest should be provided; at least 24 hr. off once a week should be the minimum allowed for each man.

Following are seven different plans of 7-day-per-week operation, each having particular advantages for certain situations. The columns indicate typical machine numbers, and the days of the week indicate typical payroll numbers of workmen.

PLAN No. 1

Explanation:

Plan No. 1 contemplates a floating shift. This floating shift would divide the machines up into units of six each. The floating shift would work on a different machine each day. The day off for the men on the regular shift varies for different days of the week. In other words, one man might have his day off regularly on Monday, another man regularly on Tuesday, etc.

Outline:

An outline of this plan is shown below. The floating or relief shift is shown as "R." The plan, of course, is uniform for the other two shifts.

	Machine Numbers						
Day of Week	1	2	3	4	5	6	
Monday.....	1	2	3	4	5	6	
Tuesday.....	1	2	3	4	5	R	
Wednesday....	1	2	3	4	R	6	
Thursday.....	1	2	3	R	5	6	
Friday.....	1	2	R	4	5	6	
Saturday.....	1	R	3	4	5	6	
Sunday.....	R	2	3	4	5	6	

Advantages:

(a) This plan requires hiring only one new man for each six men presently employed. As a matter of fact, fewer new men are required with this plan than for any of the others.

Objections:

(a) The floating shift must be a crew of experts. In other words, each man on the floating shift must be able to run six different machines.

(b) The men on the regular shift do not earn all the same money. For example, the man (payroll No. 1) who works from Monday through Saturday (one time and one-half day) does not earn the same as the man (payroll No. 3) who works from Monday through Thursday and then Saturday and Sunday (one time and one-half day and one double time day).

(c) While one man of the seven earns the same as he does now (assuming the plant is now operating 5 days per week), five of the others would earn considerably more per week, since they would work 48 hr. and would be paid for 60 hr. (assuming that time and one-half for Saturday and double time for Sunday is the overtime policy).

PLAN No. 2

Explanation:

With Plan No. 2 two additional men are added for each group of seven machines on each 8-hr. shift. The plan is worked out for a set-up where the overtime policy is double time for both Saturday and Sunday. A similar plan could be worked out for any other system of overtime compensation. Every man earns the same as at present (assuming 6 days per week operation is already in progress); in other words, he gets 56 hr. pay per week. Those men who work 5 days per week, work either on Saturday or on Sunday only. Those men who work both Saturday and Sunday work only three week days and are off for two days during the week.

Outline:

An outline of the plan is shown below. Only one shift is shown, since the other two shifts duplicate this same pattern.

	Machine Numbers						
Day of Week	1	2	3	4	5	6	7
Monday.....	1	2	3	5	6	4	8
Tuesday.....	1	2	3	5	6	7	8
Wednesday....	1	2	3	5	6	7	9
Thursday....	1	2	4	5	6	7	9
Friday.....	1	2	4	5	6	8	9
Saturday....	1	3	4	5	7	8	9
Sunday.....	2	3	4	6	7	8	9

Advantages:

(a) All men earn the same per week as at present.

Objections:

(a) Two-thirds of the men must be able to operate two machines, although no man is required to operate *more* than two machines.

(b) Two men must change from their present schedule of 5 days per week and Saturday to 5 days per week and Sunday. This is less desirable from the standpoint of the men. However, this schedule can be given to the two new men who must be put on. Two additional men work the same as at present, namely, 5 days per week and Saturday. The five other men who work 3 days per week and Saturday and Sunday will, no doubt, be glad to make the change, inasmuch as they will be getting an extra holiday per week in exchange for working on Sunday.

(c) Two new men are required for each seven present employees.

PLAN No. 3

Explanation:

In order to overcome the objection of the large proportion of men required to operate more than one machine as in Plan No. 2, this new plan is suggested (also contemplated for a plant paying double time for both Saturday and Sunday work). It is somewhat more complicated than the others in view of the fact that all three shifts are involved. With the two previous plans each shift would be uniform, that is to say, the outline shows only one shift and the same thing would have to be done with the other two shifts in the 24 hr.

Outline:

An outline of the plan is shown below.

	Machine Numbers						
Day of Week	1	2	3	4	5	6	7
First Shift							
Monday.....	1	5	9	13	11	20	24
Tuesday.....	1	5	9	12	11	20	24
Wednesday....	1	5	9	12	11	20	24
Thursday....	1	5	11	12	13	20	24
Friday.....	1	5	11	13	17	20	24
Saturday....	1	5	9	13	17	21	25
Sunday.....	2	6	9	13	17	21	25

Machine Numbers						
Second Shift						
Monday.....	2	6	10	14	17	21
Tuesday.....	2	6	10	14	17	21
Wednesday.....	2	6	10	14	18	21
Thursday.....	2	6	10	14	18	22
Friday.....	2	6	10	14	18	22
Saturday.....	3	7	11	14	18	22
Sunday.....	3	7	10	15	18	22
Third Shift						
Monday.....	3	4	8	15	19	23
Tuesday.....	3	7	8	15	19	23
Wednesday.....	3	7	16	15	19	23
Thursday.....	4	7	16	15	19	23
Friday.....	4	8	16	15	19	23
Saturday.....	4	8	16	12	24	20
Sunday.....	4	8	16	12	19	23

Advantages:

- (a) Only six men out of 27 are required to operate two machines (none more than two machines). This is compared to one man in six for Plan No. 1, but under that plan the one man must be able to operate six different machines.
- (b) All men earn the same per week as at present.

Objections:

- (a) Under this plan there is about equal division between the number of men working constantly on one shift as against those working some days on one shift and other days on another. In other words, 13 men out of 27 work on two different shifts (but none works on more than two shifts) and the remainder work continuously on the same shift. At least 24 hr. have been provided in every case between the times of reporting for work for any one man; that is to say, there are no short lay-offs.

PLAN No. 3a

Explanation:

This plan contemplates adding one new man for each present three man total, the new man to work on Thursday, Friday, Saturday and Sunday. In other words, the new man would be one day short per week and would work 32 hr., getting 48 hr. pay. (Assuming double time is paid for both Saturday and Sunday.)

Outline:

An outline for this plan is the same as shown for Plan No. 3 except each machine is a duplication of Machine No. 1. In other words, instead of compensating for the day short for Payroll No. 4, all the other machines are operated by four other men (one of which is a new man who works only 4 days per week).

Advantages:

- (a) No man need be trained except to operate one machine.

Objections:

- (a) One new man must be employed for each three present men. This is the highest ratio to be found in any of the plans.
- (b) The new man gets 8 hr. less pay than the others and works 8 hr. less than Payroll Nos. 2 and 3, and 16 hr. less than Payroll No. 1.

PLAN No. 4

Explanation:

The plan contemplates each present employee working 7 days a week for three weeks (21 days) and then getting a week off. Thus the men would work 2184 hr. per year and would get 2808 hr. pay (assuming double time for both Saturday and Sunday) as compared with 2496 hr. work for 2912 hr. pay under the present set-up where the plan has been operating 6 days a week including Saturday. Each shift has at least 24 hr. between beginning work on any succeeding day; in other words, there are no short lay-offs.

Outline:

An outline of the plan is shown below:

Shift	Week Numbers			
	1	2	3	4
1st	Works	Off	Works	Works
2nd	Works	Works	Off	Works
3rd	Works	Works	Works	Off
Relief	Off	1st shift	2nd shift	3rd shift

Advantages:

- (a) No man need be trained except to operate one machine.
- (b) All men get same earnings per week.

Objections:

- (a) Requires one new employee for each three present employees.
- (b) Men do not earn as much as at present, although reduction in earnings amounts to less than 4 per cent.
- (c) Ability to work efficiently for 21 days without stopping is questionable.
- (d) The relief shift does not work constantly on any one shift.

PLAN No. 4a

Explanation:

The only difference between this plan and Plan No. 4 is that instead

of rotating to different shifts, the relief shift rotates to other machines.

Outline:

The outline of the plan is the same as shown for Plan No. 4 with the exception that the different columns represent machine numbers instead of weeks.

Advantages:

- (a) Each man has a regular shift.

Objections:

- (a) The new men, or one-fourth the employees, must be able to operate three different machines.

PLAN No. 5

Explanation:

This plan contemplates working 6 hr. per day, 7 days per week and putting on a fourth shift. Under this arrangement the men would work 42 hr. per week for 51 hr. pay, as compared to 48 hr. work for 52 hr. pay with the present schedule. (Assuming time and one-half for Saturday and double time for Sunday is the overtime policy.)

Outline:

None required.

Advantages:

- (a) No men need to be trained except to operate one machine.
- (b) All men get same earnings per week.
- (c) All men work continuously on the same shift.
- (d) Since no lunch periods would be necessary, the company would gain an additional hour's production in 24. Most plants working 8-hr. shifts get only 23 hr. production per day because the day shift is down $\frac{1}{2}$ hr. (for which the men generally are not paid) and the two night shifts are generally down a total of $\frac{1}{2}$ hr. (for which the company often pays more than the half hour involved).

Objections:

- (a) Requires one new employee for each three present employees.
- (b) Men do not earn as much as at present, although reduction in earnings amounts to less than 4 per cent.
- (c) Ability to work efficiently 7

days a week continuously even for only 6 hr. per day is questionable.

PLAN No. 6

Explanation:

With this plan each shift rotates to the next shift after one week's work; for example, on Monday the 8:00 a.m. to 4:00 p.m. shift changes to the 4:00 p.m. to 12:00 p.m. shift, the 12:00 p.m. to 8:00 a.m. shift changes to the relief shift and the relief shift begins a two-day vacation. It should be noted that the men only work 5 days per week with this plan and if the plant is already working 6 days per week there would be a reduction in earnings. This plan is particularly well adapted to a continuous process industry. If the overtime policy provides for overtime after 40 hr. without penalties for Saturday or Sunday, this plan is particularly well suited.

Outline:

An outline of the plan is shown below. Note there are no short layoffs, although it might appear that the relief shift had to work 16 hr. from 4:00 p.m. Friday to 8:00 a.m. Sunday. This is not the case because the relief shift quits work at midnight Friday and does not begin work until midnight Saturday night. At the end of the Sunday work for the relief shift (from 12:00 midnight until 8:00 a.m. Monday morning) note the rotation of shifts provides that the relief shift changes to the 8:00 a.m. to 4:00 p.m. shift, which gets two days' vacation.

Shifts				
Day of Week	8-4	4-12	12-8	Relief
Monday		4-12	12-8	8-4
Tuesday		4-12	12-8	8-4
Wednesday	8-4	4-12	12-8	
Thursday	8-4		12-8	4-12
Friday	8-4		12-8	4-12
Saturday	8-4	4-12		12-8
Sunday	8-4	4-12		12-8

Advantages:

(a) No man need be trained except to operate one machine.

Objections:

(a) One new employee is required for each three present employees.

(b) No employee has a regular shift. All must rotate. Many employees would object to this strenuously.

(c) Pay varies from 40 to 64 hr. per week; but if the plant pays only twice per month, the variation be-

tween pay periods would be from 96 to 120 hr.

(d) Earnings would average less (216 hr. in four weeks as compared to 224 hr. at present).

PLAN No. 7

Explanation:

This plan was devised to overcome most of the objections to the other plans and will prove to be the most desirable except in cases where one operator cannot be trained to operate five different machines.

Under this plan the machines are divided up into groups of five. A relief man must operate each of the five machines on different days. Each man, including the relief man, works five days and then is off a day, works five days again and then is off a day, etc. Over a period of six weeks each man will have had his day off come on each day of the week.

Thus, regardless of the overtime payment policy in effect, each man over a period of six weeks gets the same pay. Every man is treated alike; this is an important point because, although the employees might not object at first to the unequal hours work and pay brought about by the other plans, it will soon come to their attention that some men are getting a worse break than the men working beside them.

Under this plan the men would average 47 hr. work per week as against six day per week operation of 48 hr. Assuming time and one-half for Saturday and double time for Sunday, the men would average 56 2/3 hr. pay as compared to 52 hr. pay under the six-day per week operation. In other words they would work 1 hr. less and get 4 2/3 hr. pay more.

Many variations of this plan can be devised. For example if work seven days per week and one day off is desired, this can easily be accomplished. The machines would be divided into groups of seven each. The relief operator must be able to operate seven machines.

A greater number of work days before allowing a day off can also be provided, such as eight days, nine days, etc. However, six days and groups of six machines cannot be used, for this would make each man's day off stationary as far as coming on different days of the week is concerned. This would defeat one of the major advantages of this plan.

Outline:

An outline of this plan is shown below. The floating or relief shift is shown as "R." The plan, of course, is uniform for the other two shifts.

1st Week	Machine Numbers					
	Day of Week	1	2	3	4	5
Monday	R	2	3	4	5	
Tuesday	1	R	3	4	5	
Wednesday	1	2	R	4	5	
Thursday	1	2	3	R	5	
Friday	1	2	3	4	5	
Saturday	1	2	3	4	5	
Sunday	R	2	3	4	5	

2nd Week	Machine Numbers					
	Monday	1	R	3	4	5
Tuesday	1	2	R	4	5	
Wednesday	1	2	3	R	5	
Thursday	1	2	3	4	5	
Friday	1	2	3	4	5	
Saturday	R	2	3	4	5	
Sunday	1	R	3	4	5	

3rd Week	Machine Numbers					
	Monday	1	2	R	4	5
Tuesday	1	2	3	R	5	
Wednesday	1	2	3	4	5	
Thursday	1	2	3	4	5	
Friday	R	2	3	4	5	
Saturday	1	R	3	4	5	
Sunday	1	2	R	4	5	

4th Week	Machine Numbers					
	Monday	1	2	3	R	5
Tuesday	1	2	3	4	R	5
Wednesday	1	2	3	4	5	
Thursday	R	2	3	4	5	
Friday	1	R	3	4	5	
Saturday	1	2	R	4	5	
Sunday	1	2	3	R	5	

5th Week	Machine Numbers					
	Monday	1	2	3	4	R
Tuesday	1	2	3	4	5	
Wednesday	R	2	3	4	5	
Thursday	1	R	3	4	5	
Friday	1	2	R	4	5	
Saturday	1	2	3	R	5	
Sunday	1	2	3	4	R	

6th Week	Machine Numbers					
	Monday	1	2	3	4	5
Tuesday	R	2	3	4	5	
Wednesday	1	R	3	4	5	
Thursday	1	2	R	4	5	
Friday	1	2	3	R	5	
Saturday	1	2	3	4	R	
Sunday	1	2	3	4	5	

Advantages:

(a) This plan requires hiring only one new man for each five presently employed.

(b) Each man gets the same break (over a period of six weeks).

Item	1	2	3	3a	4	4a	5	6	7
Ratio: New men to present employees	1 to 6	2 to 7	2 to 7	1 to 3	1 to 5				
Must operate more than one machine	1 in 7	1 in 3	2 in 9	0	0	1 in 4	0	0	1 in 6
Maximum number of machines operated by one man	6	2	2	1	1	3	1	1	5
Earnings same as present	2 in 7	All	All	3 in 4	None	None	None	None	None
All men uniform earnings	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Variation between pay periods	No	No	No	No	No	No	No	Yes	Yes
Men constantly on one shift	Yes	Yes	No	Yes	3 in 4	Yes	Yes	No	Yes
Hours production gained per week	23	23	23	23	23	23	30	23	23
Efficiency impaired by no days off	No	No	No	No	Yes	Yes	Yes	No	No

Plan Numbers									
1	2	3	3a	4	4a	5	6	7	
1 to 6	2 to 7	2 to 7	1 to 3	1 to 5					
1 in 7	1 in 3	2 in 9	0	0	1 in 4	0	0	1 in 6	
6	2	2	1	1	3	1	1	5	
2 in 7	All	All	3 in 4	None	None	None	None	None	
No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	
No	No	No	No	No	No	No	Yes	Yes	
Yes	Yes	No	Yes	3 in 4	Yes	Yes	No	Yes	
23	23	23	23	23	23	30	23	23	
No	No	No	No	Yes	Yes	Yes	No	No	

as to which day of the week his day off falls on, amount of overtime paid for and amount of hours worked.

(c) There is no transfer from one shift to another.

(d) The relief man is trained as a future foreman.

Objections:

The relief man must be an expert, being able to operate five different machines.

Phosphorus Concentrates on Steel Blow-Hole Surfaces

THAT phosphorus concentrates on the surfaces of the tiny air pockets or blow-holes on the surfaces of cast iron or steel has been recently proved by the use of radioactive tracers, according to Dr. W. M. Shoupp, physicist, Westinghouse Electric & Mfg. Co., East Pittsburgh. The fact that excess phosphorus tends to embrittle steel makes this discovery important since it may lead to improvements in steel-making technique.

In Dr. Shoupp's experiments, a sample bath of steel was melted down and radioactive atoms, or

traces, of phosphorus were placed into it, the atoms being made artificially radioactive by bombardment in an atom smasher. While the radioactivity of the phosphorus will not effect the action of the element, it does reveal its presence.

The melted steel, then poured into small disks, froze. In a darkroom, a piece of photographic film was laid on each side of the disk, two brass plates were placed outside the film, the stack of film clamped with a C clamp and the whole thing placed in a light proof tin can.

Upon development, the film revealed blotches caused by the rays from the phosphorus tracers. The light areas on the film correspond to the blow-holes in the steel disk, indicating that the phosphorus was concentrated at the surfaces of the blow-holes.

By treating other elements, such as carbon, sulphur, manganese, and silicon, in a similar manner, making them artificially radioactive, their presence likewise can be determined.

RIGHT

FIG. 1—This simple device (right), called a "tin can camera," was used in the experiments to determine the presence of phosphorus in a steel disk. The can protects the film from light during the many hours of necessary film exposure.

BELOW

FIG. 2—The light areas on the film show the concentration of phosphorus around blow-holes in the steel, as recorded by the invisible rays from radioactive phosphorus atoms.



Large Gears Cut With a Slotted Cutter

THE principal difficulty in cutting large diameter gears on available gear cutting machinery is in obtaining a minimum deviation in the tooth spacing. The method of indexing on such machines by the use of a worm and worm wheel gives appreciable errors on large gears due to the fact that the table worm wheel diameter is small as compared with the gear diameter and any deviations in the worm wheel tooth spacing are multiplied proportionately.

In the past, one way of indexing teeth to be cut by a slotted or miller was to scribe the teeth by hand, a microscope being used to assist in scribing a fine line through the center of each tooth space. This proved to be costly and subject to errors in lining up the scribed marks with the microscope cross hair. Our company has devised a method of "Disk Indexing" that has produced very accurate results in gears as large as 24 ft. in diameter. The method employs ground disks in combination with a special gage block and is somewhat analogous to the use of Johanssen gage blocks for measuring length.

After the gear blank is machined to the correct outside diameter, it is advisable to scribe the pitch diameter and root diameter on one side of the rim. The tooth spaces are then scribed by the use of a template and dividers with sufficient accuracy to rough cut the teeth to within $\frac{1}{8}$ in. of the finished dimensions. This rough cutting is done most rapidly by the use of a radial drill set alongside a slotted cutter. The drill removes stock rapidly, leaving only a trimming operation for the slotted cutter, the two working simultaneously as the gear blank is rotated from tooth to tooth. With such large gears, it is not practical to move the gear blank for the feed motion; instead the slotted cutter should have a movable head or an in-feed attachment on the ram tool holder. The total in-feed

By SAMUEL KOFFSKY

Chief Engineer, Simmons Machine Tool Corp., Albany, N. Y.

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motion need only be slightly greater than the full depth of the gear tooth. In rough machining the tooth spaces, stock can be removed to the full depth of tooth, leaving about $\frac{1}{8}$ in. on the tooth flanks for the finish machining. See Fig. 1 for the cutting sequences on a typical tooth space.

The precise indexing is now performed through the use of ground disks and a gage block. The object is to make a number of identical disks whose outside diameter is such that when placed around the periphery of the gear so that they touch each other and are tangent to the outer circumference of the gear, the number of disks required to circumscribe the gear will be exactly the same as the number of teeth in the gear. It is evident that for a straight rack or a gear of infinite diameter, the diameter of these disks would be exactly the same as the pitch of the gear teeth. For external gears, the diameter of the disks is smaller than the circular pitch and for internal gears it is larger.

The approximate diameter of these disks is easily calculated.

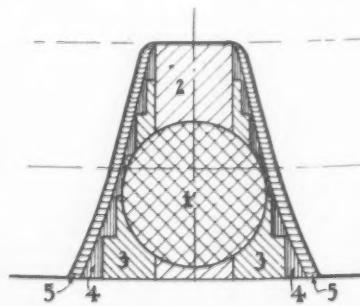


FIG. 1—Method of roughing out a large tooth space with a drill and slotted cutter. (1) Drilled hole; (2) first slotting stroke to full tooth depth; (3) staggered slotting cuts; (4) rough form slotting cuts, and (5) metal left for final finishing cuts.

Add 0.001 in. to the calculated diameter and make five disks $\frac{1}{2}$ in. thick, ground to this diameter. A $\frac{5}{8}$ -in. hole is drilled through the center to facilitate clamping the disks in place. (See Fig. 2.) For ease in identifying the disks, they will be numbered from 1 to 5.

Disk No. 1 is clamped on the gear rim so that the disk edge is tangent to the face circumference of the gear. Disk No. 2 is placed adjacent to and touching disk No. 1, and is likewise clamped in position tangent to the outer circumference of the gear. Disks Nos. 3, 4 and 5 are placed in like manner.

Disk No. 1 is not disturbed and remains as a locating point for the start of the indexing. Disk No. 2 is carefully removed and clamped in position adjacent to disk No. 5. Disk No. 3 is removed and placed next to disk No. 2 in its new position. This procedure is continued, moving the four disks, Nos. 2 to 5, around the circumference of the gear until we approach disk No. 1, which was left in its original position.

Because the disks were ground 0.001 in. oversize, the last remaining space should be too small to accommodate a disk. A micrometer measurement is taken of this space and the difference between this measurement and the diameter of the disks is noted. Dividing this difference by the number of teeth in the gear gives the amount that should be removed from the diameter of the disks. In grinding the disks to the new diameter, care should be exercised to leave them a fraction of a thousandth oversize.

Next, a second circuit of the disks around the rim of the gear can be made. This time a special gage block is used to position the disks against the outer circumference of the gear. This block is made as shown in Fig. 3. Its length is a fraction more than the tooth spacing and it has two small pads $\frac{1}{8}$ in.

a Slotter

... With the exception of several very large companies, there are few concerns in the United States equipped to hob gears running up to 24 ft. in diameter. Hence when gears of large size must be cut, improvisation of available facilities is necessary. This article tells how work of this kind can be done with a slotter, using a new precision method of indexing developed by the author. The article is timely since large gear hobs are extremely costly and take about a year to build.

wide \times 1/64 in. thick at the ends of the side that is placed against the gear face. In operation, the block is placed with the small pads against the gear face, the top surface of the block projecting about $\frac{1}{8}$ in. above the rim. In clamping the disks, each one is placed in contact with this block and also with the adjacent disk.

As before, Disk No. 1 is clamped in position and remains unmoved to serve as a point of reference, and the distance between the last disk applied and No. 1 is measured. This distance may now be some-

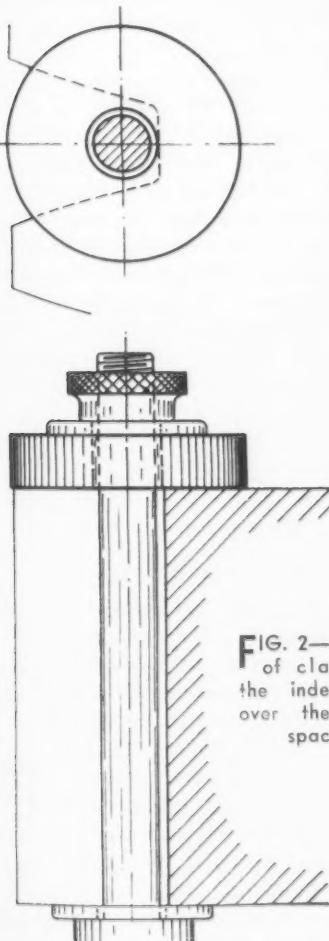
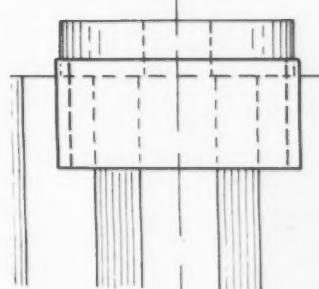


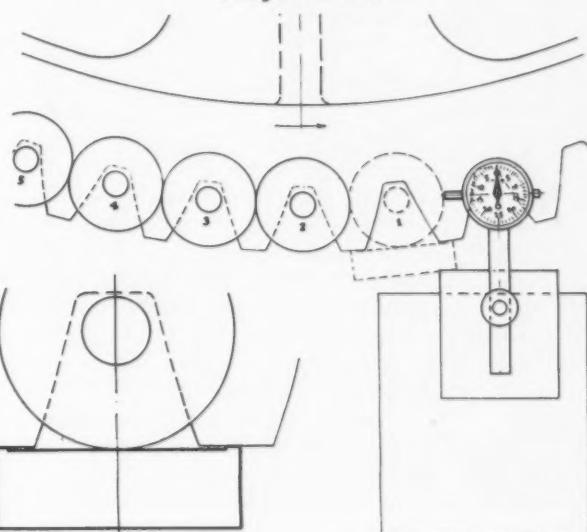
FIG. 2—Method of clamping the index disks over the tooth spaces.



what too great, by, let us say, 0.030 in. No further grinding is necessary on the disks, but a small amount is removed from the two pads of the gage block, thus bringing the disks nearer the center of the gear. The amount necessary to be removed from the pads is approximately one-sixth the closing error, in this case 0.005 in. A third circuit of the disks should now show a closing error of practically zero.

The next step is the finish cutting

FIG. 4—Actual indexing of the gear is done with the aid of a dial indicator bearing against one of the special disks. After one tooth space is finished, disk No. 1 is moved ahead and the gear rotated until disk No. 2 comes into contact with the indicator, which is brought to zero.



side by side, with each disk set tangent to the gage block. The indicator is brought against Disk No. 1 until it reads zero, as shown in Fig. 4. The first tooth is finish cut. Disk No. 1 is removed and the gear rotated, closing up the space until the indicator reads zero against Disk No. 2. While the second tooth is being cut, Disk No. 1 is placed adjacent to No. 5. This procedure is continued until all the teeth have been finished.

The principal advantage of this method of indexing is that it eliminates the possibility of accumulating errors. Any error in an indicator reading on one set-up is nullified at the next succeeding set-up. With a reasonable amount of care, a rigid machine for cutting and proper tooling, it becomes possible to cut large gears with tooth spacing deviating not more than one or two thousandths of an inch from the theoretical spacing.

New Equipment . . .

Machine Tools

The need for machine tools in national defense, and now in war production, has brought about ingenious developments in this field. Some of these improvements are discussed in the following.

THE Landis Machine Co., Waynesboro, Pa., recently announced the Landis No. 6 precision thread grinder, a new product supplementing the extensive Landis line of thread cutting machinery. The machine, developed after many years of experience in building machines for use in grinding various forms of threads on Landis chasers for die heads and collapsible taps, handles a wide variety of work diameters, lengths and thread pitches, and work and wheel speeds are practically unlimited throughout its full range. A great number of English and metric pitches may be obtained by simplification of gear box construction. Adjustable trip dogs, actuated by a limit switch, control the distance that the table will travel, and

the work table never overhangs the end of the machine base. The lead-screw, hardened and precision ground, is mounted on anti-friction bearings and is located centrally between the ways to assume the thrust load without binding or forcing the work table, and has an automatic device to compensate for backlash between the change gears. The wheel head is large, cast in one piece, and the grinding wheel is a heat-treated alloy steel, accurately ground. The grinding wheel truing device is fully automatic, providing a simple, accurate means of truing the wheel. Several different types of truing devices are available for different forms of thread grinding and are interchangeable. All rotating shafts and sliding surfaces are completely shielded from

dust and grit, and all controls and electrical apparatus are centralized at the front of the machine. The machine has about 200 left- or right-hand work spindle speeds from 3 to 144 r.p.m., and lower speed ranges from 1 to 48 r.p.m. are available by shifting the V-belt. It also has indexing attachments for multiple threads, and collets or standard three or four jaw chucks for centerless work, not requiring adapter plates.

Thread Miller

AN improved line of internal and external thread milling machines, combining precision thread milling with simplicity and ease of operation, have been developed by the Morey Machinery Co., Inc., 410 Broome Street, New York. These Morey-Shields thread millers are built in four sizes, 12 in. x 30, 60, 90 and 120 in., for right- or left-hand single or multiple threads. The cutter heads are fully universal with four self-contained speed gear changes. The 12 x 60 in. size is illustrated.

Horizontal Boring Mill

AN improved and larger Dreadnaught horizontal boring, drilling and milling machine, with anti-friction bearings throughout; automatic lubrication; built-in electrical power rapid traverse with push-button control; narrow guide construction for all moving units; push-button control for start, stop, forward, reverse, run and jog of the spindle; unit construction; multiple splined shafts with splines milled from the solid for all sliding



NEW EQUIPMENT

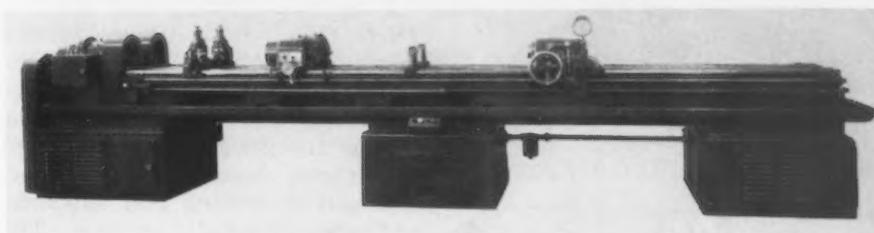
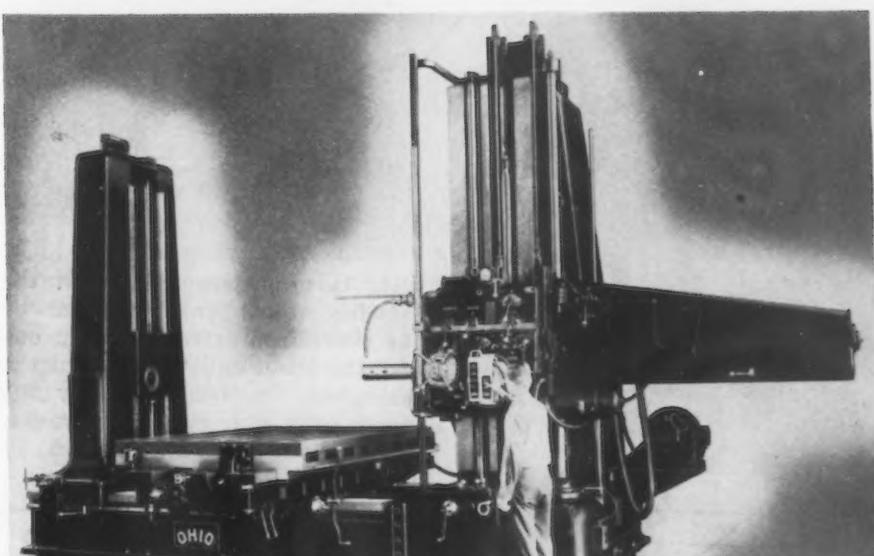
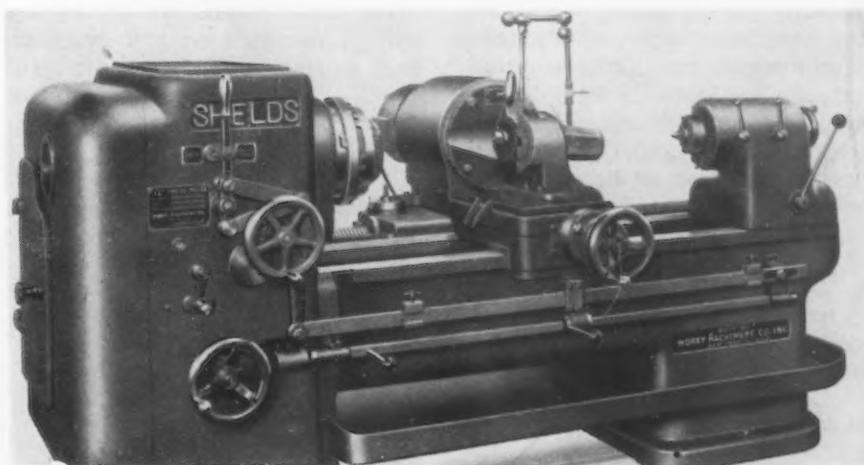
gears and clutches; and all mechanical clutches of the internal gear tooth type; is being built by the *Ohio Machine Tool Co.*, Kenton, Ohio. The counter-balanced spindle head carries the speed and feed transmission, the loads from spindle and gearing being transferred to the column face. A multiple disk, magnetic drive clutch gives complete spindle control through a portable push-button unit. The ratio between low and high speeds is 1 to 190, with maximum speed of 600 r.p.m.

Gun Driller and Reamer

A DOUBLE-SPINDLE gun barrel drilling and reaming machine, to be used either for draw or push type reaming and boring, has been announced by the *Builders Iron Foundry*, Providence. Each spindle is driven by a 3-hp. motor and power is transmitted through a V-belt and gears to roller bearing headstock which carries a four-jaw independent chuck for holding the gun barrel. The work is supported in adjustable rests along the ways and in the barrel support and drill guide member in the center of the machine. A torque overload device is mounted on the carriage, assuring maximum drill life. Magnetically filtered oil is pumped into the carriage of the machine and then through the drill shank to the cutting edge of the tool. The machine is arranged to give six spindle speeds from 175 to 1090 r.p.m. The drilling range consists of 11 feeds from 0.0005 to 0.003 in. per rev., and the reaming range is 10 times the drilling range. Capacity is 1½ x 84 in.

Drill Press

THE *Delta Mfg. Co.*, Milwaukee, announced a new and improved line of low-cost drill presses, with power feed operating directly off the bottom drive of the motor instead of off the spindle, making possible a wide range of feeds from 0.001 to 0.16 in. per spindle rev. in the slow speed press and from 0.0005 to 0.009 in. per spindle rev. in the high speed machine. Two four-step cone pulleys and a special belt tension release make feed speed changes quick and safe. Other special features include: Quick traverse by hand from starting to work position; instant switching from power to hand feed and reverse without changing or



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FROM Top to Bottom: Thread miller developed by *Morey Machinery Co.*, New York; Horizontal boring mill, built by the *Ohio Machine Tool Co.*, Kenton, Ohio; the *Builders Iron Foundry*'s Providence, R. I., new gun driller and reamer; and the drill press recently announced by the *Delta Mfg. Co.*, Milwaukee.

• • •



NEW EQUIPMENT

removing parts; safety lock for when the power feed is disengaged; and adjustable automatic stop and return. The new line includes single and multiple spindle 17-in. units, in slow and high speed models with table or head raising mechanisms.

Drill Press

A 20-in. drill press, available for power, hand, or foot feed, has been recently announced by the *Walker-Turner Co., Inc.*, Plainfield, N. J. The press has a built-in clutch that is part of the worm

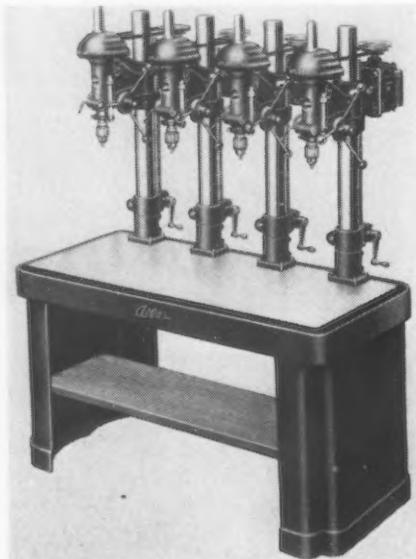


drive, assuring smooth positive action at all points of spindle travel. Four rates of feed are provided for each of the five spindle speeds, and a chart on the press indicates the rate of feed in 0.001 in. per rev. of spindle. The machine will handle all drilling and reaming operations from 1 in. in cast iron down to 1/16 in. It is equipped with a No. 2 Morse taper spindle nose and is available in single or four spindle models.

Multiple Spindle Drill Press

To step up production on small-hole drilling and tapping, a new series of two, three, and four spindle drilling machines has been introduced by the *Atlas Press Co.*, Kalamazoo, Mich. The spindle

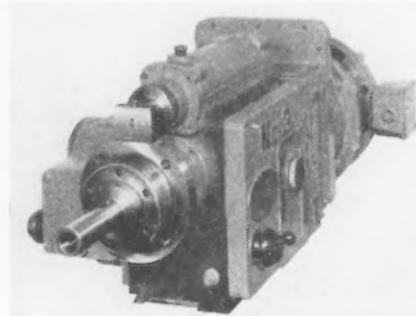
drive units consisting of splined pulleys mounted on ball bearings, are entirely separate from the spindle. This floating drive trans-



mits turning power only to the spindles which are supported by the six-splined drive pulleys at one end, the lower quill bearings at the other, and between these by the upper quill bearings. Center distances between spindles are 15, 18 and 13 in.

Tapper, Driller, Miller

THE model E Empco unit, made by the *Enterprise Machine Parts Corp.*, Detroit, incorporates many new features to increase the adaptability and capacity of these machines. The front face of the unit is keyed and tapped to accept lead screw brackets for tapping, drill guide bushing and supports, and outboard spindle bearings. The planed top surface will accept all milling overarm supports, and a machined pad on the side permits attaching interlocking devices or index table drives. A large flange accurately drilled has been provided for using multiple spindle heads or



milling attachments, the spindle rotating in either direction. Special or standard milling attachments may be obtained for any size of this machine. Planetary type thread milling or similar work can be handled. The machine is made in four sizes.

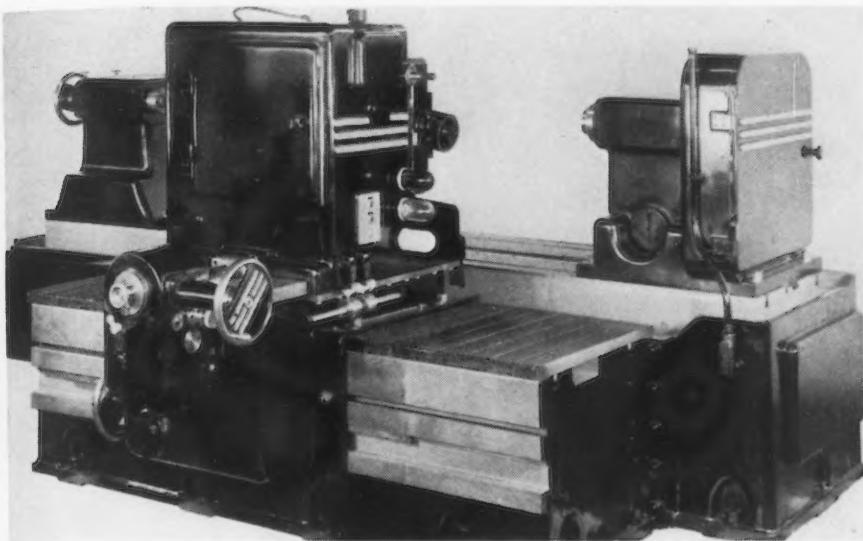
Small Gear Hobber

THE American Micron spur gear hobbing machine, with a capacity for spur gears and pinions up to 2 in. in diameter, and 20 d.p., has been announced by the *Triplex Machine Tool Co.*, 125 Barclay Street, New York. This hobber was designed to cut accurately brass and steel wheels and pinions, such as are used in watches, clocks, meters, gages and other pre-



cision instruments, using a hobbing method of generating the tooth profiles. The hob spindle, mounted on a vertical slide, has a micrometer hand feed, and the entire assembly has a horizontal power screw feed with automatic stop. A set of index change gears for any chosen number of teeth between six and 390 is furnished with the machine, and additional change gears are available. A set of six feed change gears, between 0.004 and 0.030 in. per rev. of the hob is provided with the machine. A handwheel engages the feed of the hob spindle slide and an adjustable control stops it when the work is finished. Hob spindle speeds of 518 r.p.m. for steel and 1030 r.p.m. for brass are standard, but additional motor pulleys can be furnished to provide different speeds. A constant flow of coolant is provided.

NEW EQUIPMENT



Large Gear Finisher

A NEW line of gear finishing machines, making available the crossed-axis principle of gear shaving for large gears, has been announced by the *Michigan Tool Co.*, Detroit. The new line of machines includes three sizes, the largest being capable of finishing gears up to 4 ft. in diameter and 20 in. wide. The crossed-axis shaving principle in finishing large gears assures long life, accuracy and quiet operation. In the two smaller sizes, the method of operation is by cutter reciprocation, that is, the cutter is power driven and the work follows. The work is reciprocated axially during the cutting cycle while the cutters are fed radially into the work. The large machine uses the principle of rotating the work with the shaving cutter, which follows across the face of the work. Two optional finishing methods may be had. In the first, the cutter slide may reciprocally translate parallel to the work axis, and feeds into the work at the end of translation. In the second method, the cutter slide is set vertically, in which case a complete cycle consists of one translation of the cutter and return at right angle to the work axis. Cone-Drive units are used in these machines, and they are equipped with two sets of work centers. Work weighing more than 2500 lb. can be supported between the larger centers. Thus the machine can handle a gear mounted on its shaft, eliminating the possibility of errors in concentricity due to mounting.

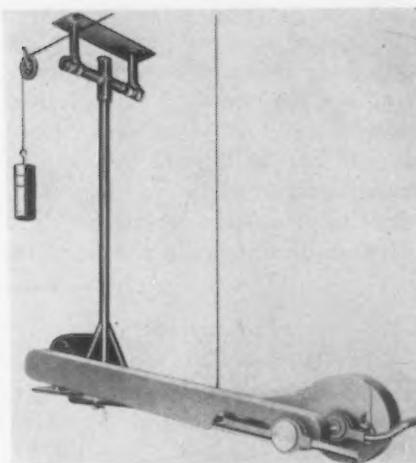
Horizontal Turret Lathe

THE type 2FR multiple tool, single spindle, semi-automatic multi-purpose lathe was recently marketed by the *Frankel Machinery Corp.*, 118 East 28th Street, New York. It is designed for the use of all standard turret lathe tools, and can be used for tapering, form turning, and facing on one or more working planes. The large 15 in. face-plate-like turret provides for 16 tool positions near its circumference, and revolves on a horizontal axis parallel to the work spindle, instead of a vertical mounting, eliminating the necessity of a cross slide. An auxiliary cross slide may be attached if necessary. The horizontal mounting of the turret

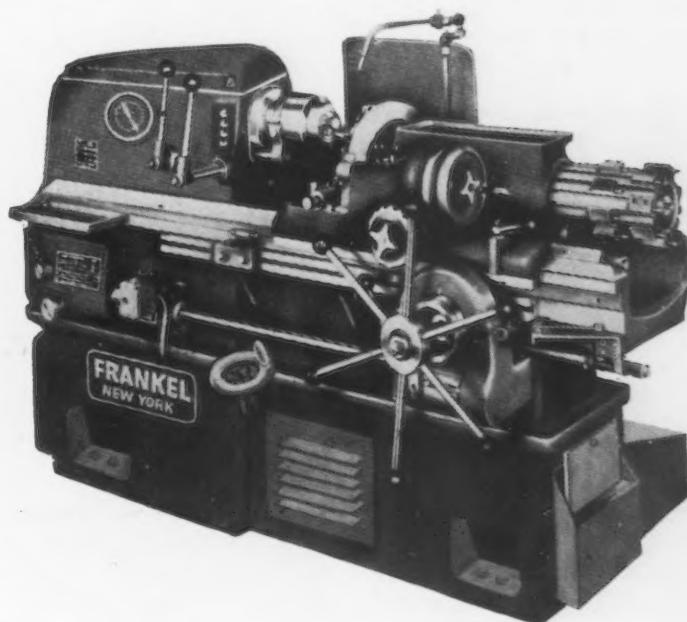
permits the use of a large and long pivot bearing which increases the rigidity of the tool. Eight feeds are available without changing back gears, and the automatic feed can be tripped precisely by means of stops.

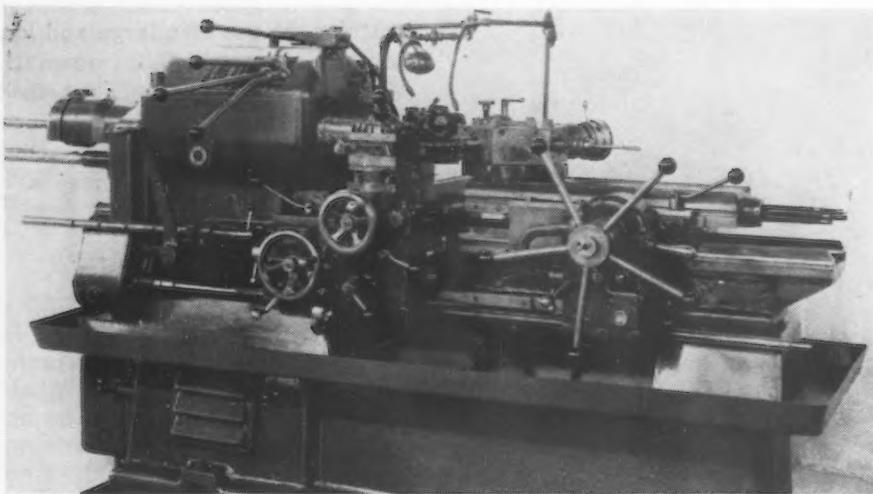
Swing Frame Grinder

JEFFERSON MACHINE TOOL CO., Cincinnati, recently introduced a swing frame grinding and polishing machine for wheels up to 14 in. in diameter. The machine can be swung forward and backward, up and down, right and left, and at any degree of angle or twist. It is exceptionally adapted for grinding, polishing, and buffing



big pieces, and will grind and clean rough castings of any shape, size, or material. Counterbalancing weights makes operation of the machine easy on the operator.





Turret Lathe

A NEW Merritt-Milholland turret lathe designed to handle the newer cutting tools at high speeds is being offered by *Merritt Engineering & Sales Co., Inc.*, Lockport, N. Y. These lathes, Nos. 4 and 5, are built with full cabinet base, have an 11-in. spacing of the ways to give extra cross-wise rigidity and stability, and the hardened

V-ways have soft steel cores eliminating residual stresses in the metal. Another feature is the arrangement of the cross feed knock-out stops, by means of which instant choice of four positions involving forward and reverse feeds are effected by the turn of a knob. The headstock has 12 speeds forward and reverse, from 35 to 715 r.p.m. with automatic spindle brake and multiple disk clutch.

Tool Grinder

A NEW two table, 10 in. carbide tool grinder combining facilities for straight wheel peripheral and cup wheel face grinding has been added to the line of carbide tool grinders manufactured by *Hammond Machinery Builders, Inc.*, Kalamazoo, Mich. Work tables on the new grinder tilt from level to 25 deg., and slide to any point of adjustment on machined ways, locking in selected position. The tables are slotted to accommodate the protractor angle-guide and are

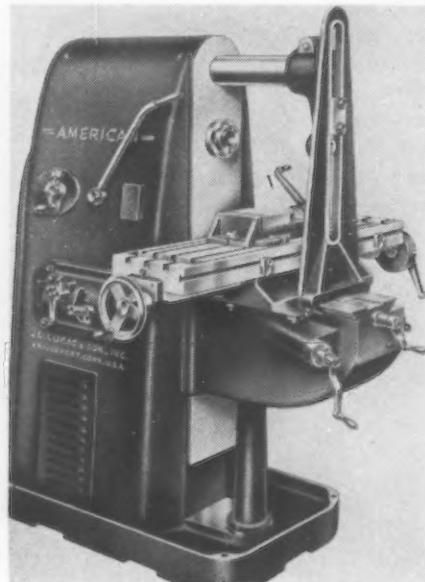


grooved to keep the working surface free from grit and dirt that may affect the grinding angle ac-

curacy. For wet grinding with a diamond cup wheel, the right side of the machine can be fitted with a reservoir mounted over the wheel on the guard. Drip feed of moisture to the wheel is controlled by a needle valve.

Plain Miller

THE No. 2 American plain milling machine, with infinite spindle speeds, standardized spindle



nose, motor in base drive, and other important features, has been developed by *J. L. Lucas & Son, Inc.*, Bridgeport, Conn. Spindle runs in phosphor bronze bearings. The miller was designed as an all-purpose machine, and can be supplied for 220, 440, or 550 volt, 25, 50, or 60 cycle, 2 or 3 phase alternating current. Variations in speed are obtained instantly while the machine is in operation by a single direct reading dial control, and a multiple V-belt drive from a U. S. Vari-drive motor to the spindle is regulated through a twin-disk duplex clutch.

Universal Miller

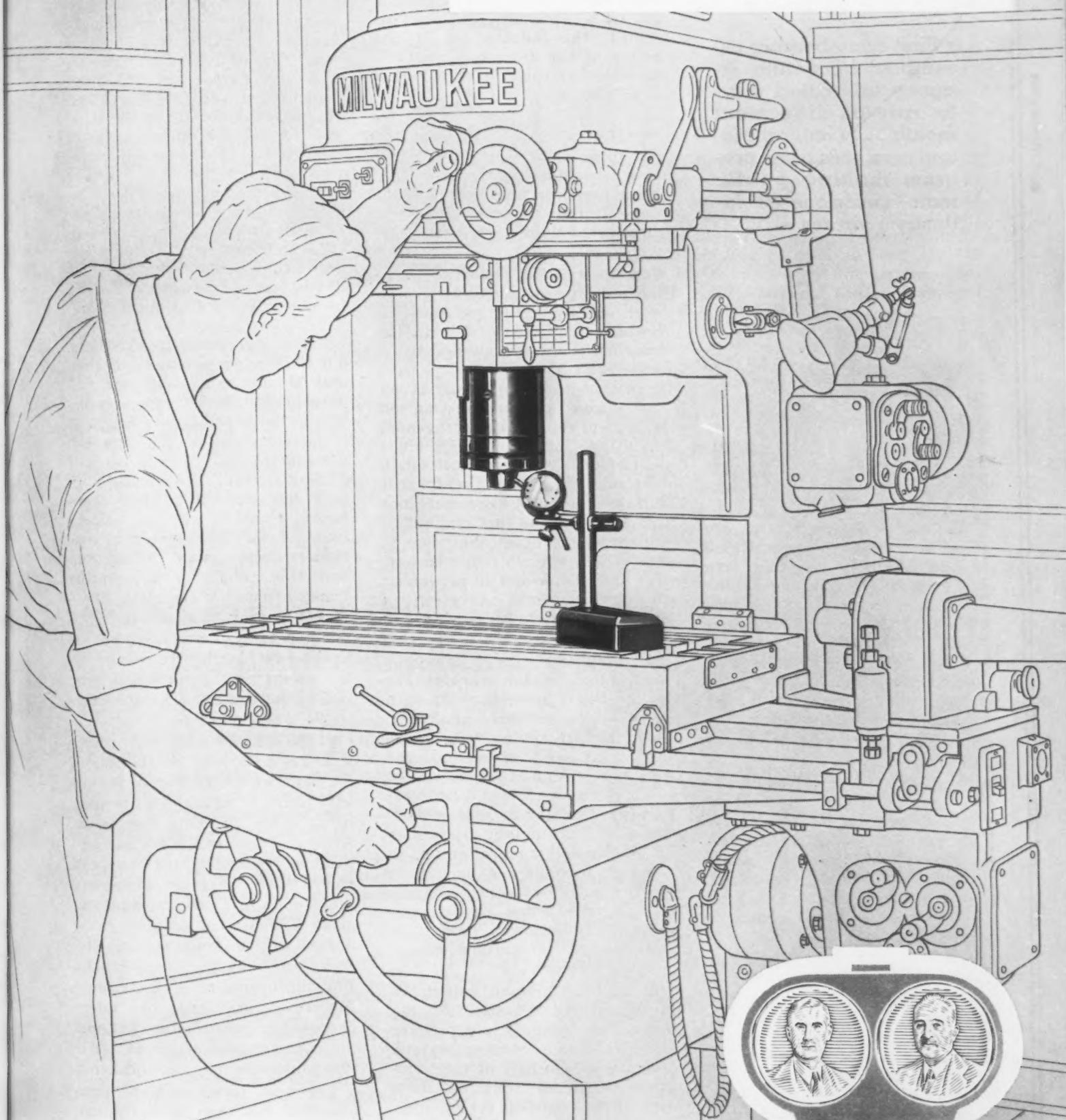
UNUSUAL flexibility was designed into the No. 20 Cross universal milling machine by the *Cross Gear & Machine Co.*, Detroit. The major feature of being able to adjust the cutter spindle to any



angle in any plane immediately makes possible the completing of an entire series of operations with minimum handling. It is possible to mill vertically, drill at any angle, jig bore at another angle, spot face at a third angle, and sink a horizontal keyway without moving or resetting the work in this machine. The machine is suitable for heavy milling operations, a horizontal spindle position enables T-slitting, and a hydraulic duplicator permits profiling. Dies, punches, and molds can be accurately reproduced from master forms.

Checking run-out and setting of spindle and head on Milwaukee Model D Rotary Head Tool and Die Milling Machine — a typical inspection to maintain Milwaukee standards of accuracy.

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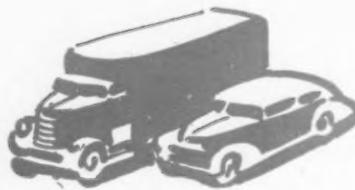
CORPORATION



Milwaukee MILLING MACHINES

Assembly Line . . .

• First army bomber assembled from auto industry fabricated parts to roll off line next month . . . General Motors man sees arms program making public more conscious of industry's virtues.



DETROIT — Confirmation of the fact that the combined auto-aviation industry program for production of bombers is months ahead of schedule came last week in announcement from OPM that the first Army bomber assembled from parts fabricated by the automobile industry will roll off the line of the new \$11,000,000 North American Aviation plant in Kansas City shortly after Jan. 1.

The first hint that this might happen came only a few weeks ago when it was revealed that the Detroit and Memphis plants of Fisher Body Division of General Motors had shipped parts and sub-assemblies for the twin-engine B-25 medium bomber. That meant that the first major assembling operations were not far away.

Now the next thing to watch for is the beginning of assemblies on the Consolidated B-24 series bombers which will be a joint effort of Ford and the aviation industry, with assemblies to be completed at Tulsa and Fort Worth, in addition to assemblies at the Ford Willow Run plant. Then will come the assembly of Martin B-26 bombers at Omaha from parts and sub-assemblies supplied by Chrysler, Hudson and Goodyear.

That's good news, and offers assurance that if the government

does want 1000 bombers a month, as OPM Director Knudsen has stated, the industry is in the swing of the thing now and will be able to reach that kind of a schedule.

THE relationship of machine tools, assembly lines and "big" business to the war program has been analyzed by Paul Garrett, GM vice president and director of public relations.

"The machine has become," Garrett said, "at this grave hour the protector of people's right to work and live in a free America. Nothing has so captured the imagination of the public as our new military machines. With them comes the new realization that back of the mechanized equipment for the war front must in turn be other giant machines—machines for production in factories and shops and, still further back, still more machines and skill to make this production equipment. The assembly line is now on its way to win the war. Our basic know-how in producing for civilian wants has given us the know-how in producing for war wants."

Of "bigness" in business he said: "Just as the machine has assumed new importance, so with bigness in business. Industry, grown to size against tough competition, is able to assume now the gigantic production job demanded by modern warfare. War experience is teaching us that in dealing with size in industry we so often give too much attention to physical size and not enough to the far more important elements of size represented by aggregations of engineering, production and management talents trained to work together."

"People understand better the facts of small industry. No big industrial concern could produce a truck, engine, bomber or tank except with the help of the thousands of small concerns upon which it is dependent for supplies, skills and parts."

IT has been said repeatedly that this is a "mechanized war" but not often has it been pointed out that it is, more specifically, a

"horsepower war." Garrett makes that clear with some comparative figures. In World War I, equipment for a division of infantry was 4400 horses and 153 motor vehicles, he said. In World War II it is "no horses, but 3,500 motor vehicles of 160 types." In 1918 an infantry division had equipment with 3300 hp. Now an armored division has 400,000 hp. That is as much as a city the size of San Francisco has available. It is the horsepower of World War I, multiplied 121 times. And industry in this country has no equal in the production of horsepower, he points out. Grand Coulee Dam will generate 2,400,000 hp. but the engines produced by General Motors alone last year will develop 240,000,000 hp.—equivalent to 100 Grand Coulee Dams.

Garrett spoke at the 36th anniversary dinner of the Adcraft Club of Detroit. His remarks suggest the possibility that these days, in which citizens become conscious of the benefits of machinery and mass production, finds the people in a receptive frame of mind to hear the whole story, so they will not again be tempted to swallow the claims of Technocrats and others who in the recent past generated a very real threat against the machine.

A PROGRESS report comes from Chrysler on its project for the mass production of Bofors anti-aircraft cannon—a weapon being made for both the U. S. Army and the U. S. Navy and apparently badly needed by both right now. Chrysler undertook the project in February, and was given European drawings of the Bofors with instructions to redesign, and change specifications and dimensions to fit the gun to American practices of interchangeable manufacture. Later the company was given an order to produce the guns in quantity.

The new drawings were completed in less than three months. Two sample guns were completed in less than 11 weeks. Chrysler planned its operations and ordered machinery for quantity production of the guns while it was making sample models. More



80

Needed - rush

so "Shorty" cut them on
the Keller Machine

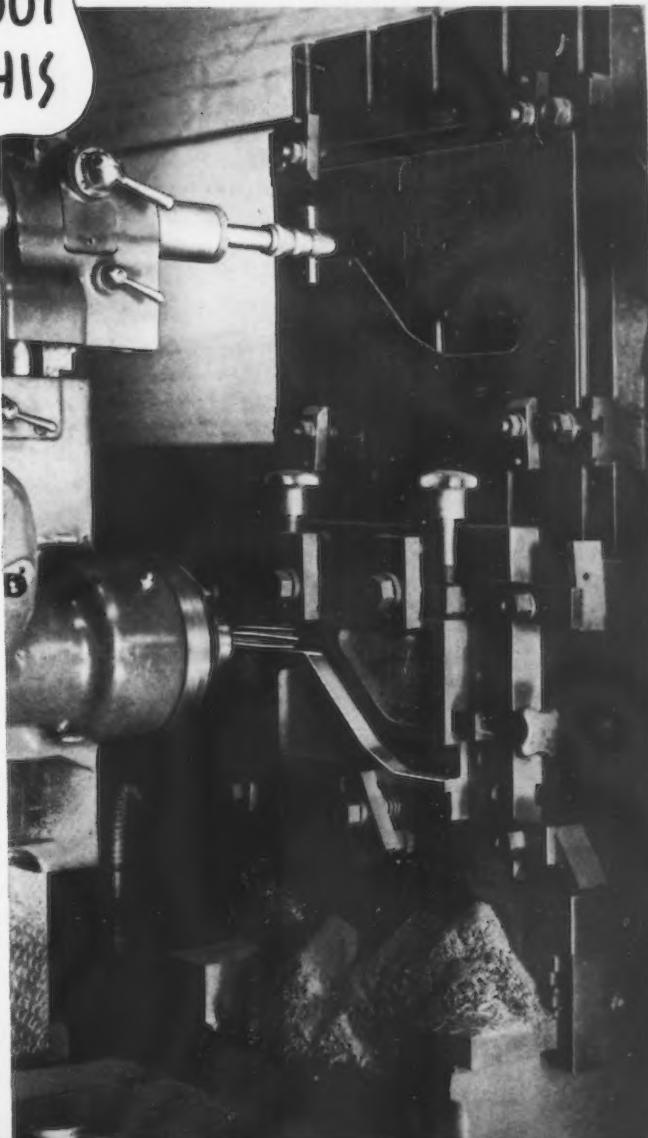
Typical of Keller Machine versatility, this job is only one of thousands. Shorty needed but a brief time to lay out and cut the template. Then the job went into production right away. No complicated tooling that eats up time and money . . . no trouble over the accuracy involved . . . the job came off the machine "okay" ready for use.

Every Keller Machine is serving our defense needs promptly and efficiently. And at some future day those same machines will go to work on peace time projects with equal ease.

Your Keller equipment will stand up under 24-hour schedules, so load on the work. If our experience can help you increase production, our men are eager to help. Ask a P&W Sales Engineer to show you how to get more out of your Keller Machine.

Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford, Conn.

This job called for 40 right hand and 40 left hand indexing cam paths for defense machine tools . . . needed in a hurry. The same simple sheet metal template is used for both by merely turning it over. The $\frac{1}{8}$ " cutter takes one roughing cut down the middle, and then a finishing cut on each side. The slot is $1\frac{1}{8}$ " wide (tolerance minus zero, plus .002"). 10 $\frac{3}{4}$ " long, $\frac{3}{4}$ " deep . . . completed in 45 minutes each, floor to floor.



PRATT & WHITNEY

than 1400 machine tools were required. Of this number, it was possible to utilize 400 from regular automobile production equipment. In addition, necessary jigs, tools and fixtures were prepared.

Setting aside 400,000 sq. ft. in 11 Plymouth, Dodge, DeSoto and Airtemp plants in Michigan, Indiana and Ohio, Chrysler also constructed two new factories totaling 200,000 sq. ft. The final assembly of the guns will take place in the Lynch Road plant, built by the Dodge Brothers in the last war for defense manufacturing.

The cannon itself has more than 500 individual parts including its eight-foot, 250-lb. barrel. In order to turn the guns out by mass production methods the parts are re-designed to closer machine limits than they were by the original makers. As a result many more parts of the gun will be interchangeable than under the former hand-fitting method. Both machining and assembling time have been substantially reduced.

BLEAKNESS of the automotive outlook is reflected in cancellations of orders that have literally deluged materials suppliers in the last fortnight.

There is very definite indication in the attitude of the automobile people that they do not expect to be able to build many passenger cars after the first of the year. There is to be a session in Washington early in January to figure out what can be done for establishment of a February quota. (Incidentally, it appears that when the mills of OPM begin to grind, they grind on without stopping. We refer to the fact that on Dec. 10—coincident with information that December and January quotas were being slashed—the mimeograph machines in Washington turned out an "L" order with a quota of 174,122 passenger cars for February. This was the number previously agreed upon, but obviously upset by the start of the war. Apparently no one had a chance to stop the issuance of this particular order, even though it means nothing now.)

The industry is going to have a



RIVER OF PISTONS: Airplane engine pistons flow down this conveyor of the aircraft division of Hudson Motor Car Co. for Wright Aeronautical Corporation's Ohio plant.

lot of its efforts directed into other channels, including some important ones in foreign lands, it appears. Preliminary information is that General Motors Export Division is preparing to operate bases throughout the world for the repair and maintenance of Lend-Lease trucks, airplanes and other mechanical equipment. The government has not given up title to these goods and intends to see that they are kept in good operating condition. Along the Burma Road, for example, it may soon be possible to pull into a GM service station for a general over-haul. Major repair bases will serve a large group of service stations and will engage in the virtual rebuilding of worn-out or damaged axles, engines and other basic units.

AUTO production in January is going to be spread out as much as possible, with three and four-day operations prevailing each week. The general pattern for Plymouth, for instance, is 16 days production on its 12,592 units. For the whole Chrysler Corp. it is 16 days on its 23,635 units. This indicates that production departments have struggled valiantly with the problem now in their hands; despite a quota cut of 50 per cent, they have held operations up to a four-day schedule each week.

Plants have been taking every measure to ease the layoff blow. In late November, for instance, Briggs assembled more than 1500 employees at two meetings in a high school here and gave them an opportunity to enroll for special training to enable them to get defense jobs. They were told frankly that they faced indefinite layoffs because of automotive curtailment. Response swamped enrollment desks and exhausted the supply of enrollment blanks. Eventually most of the 1500 signed up.

At present Briggs has 925 employees enrolled in 76 classes, some taking several of the available courses which include blueprint reading, shop mathematics, aircraft sheet metal work and principles of inspection, according to H. J. Roesch, industrial relations director. In addition, about 600 are now taking eight-week courses in Briggs vestibule aircraft workers school. It soon will be giving instruction to 900 at a time on a three-shift basis.

In an attempt to provide basic training, especially in attitudes toward defense work, Briggs is now giving employees a visual education consisting of eight movies and slide films. Each day groups of 90 workers from each shift attend these sessions, taking a half hour off from work for the training.

Pittsburgh Traffic Club Cancels Annual Dinner

Pittsburgh

• • • **John B. Keeler**, assistant general traffic manager of Koppers Co., who is president of the Traffic Club of Pittsburgh, announced Dec. 16 that the annual dinner of the club, scheduled for Jan. 22, has been cancelled because of the war.

What is the TRUE MEASURE of Tool Performance?



Is it the **number of pieces** the tool produces during its lifetime? Or is it the total output of the machine or press **within a given period of time**?

The true measure of tool performance is not **how many** pieces a tool will make, but **how quickly** it will make them. Almost anyone could make a blanking die heavy enough to produce a million pieces, with frequent regrinding. The trick is to make a million-piece die requiring **no** regrindings . . . or at the most, only one or two. The real secret of high production is **uninterrupted** production.

And that calls for top tool performance, perfect design, expert tool making, careful steel selection and exact heat treating procedures. Right there is where Carpenter can be of real help to you, with a simplified program providing an improved method of tool steel selection and correct heat treating data. This simplified Carpenter program has often saved as many as 60 hours per month on **one machine**.

Ask your Carpenter representative for a copy of the **Matched Tool Steel Manual**. In it you will find 159 pages giving definite ways to simplify the selection and heat treatment of tool steels. The Carpenter **Manual** now contains a special **Tool Index and Steel Selector** . . . showing which steel best meets the requirements of each tool room job. Ask your Carpenter representative for this aid to better tool performance.

THE CARPENTER STEEL COMPANY • READING, PA.

Carpenter
MATCHED
TOOL STEELS



Washington . . .

• **Sweeping powers given the President include right to skip formalities in awarding contracts . . . Censorship will be wisely exercised and not used for rigid suppression of facts people should know, according to present indications.**



WASHINGTON — Now that the United States is at war, all talk of government regimentation of industry, of economic and social life or of anything else has disappeared with the rapidity of a snowflake in a blaze.

Nothing demonstrated this fact more strikingly than the quick action, devoid of debate, of the Senate and the House last week when the President was granted war powers that were even greater than those conferred upon

President Wilson during the first World War. Reflective of the exigencies of war it was interesting that the legislation granting tremendous powers to the President was sponsored by two of bitterest opponents in Congress to peace-time Government regimentation—Senator Frederick Van Nuys of Indiana, chairman of the Senate Judiciary Committee and Representative Hatton W. Sumners, chairman of the House Judiciary Committee, both Democrats.

Under the legislation, shot through both branches of Congress simultaneously, its sweeping powers give the President authority to completely reorganize the functions of government, and to do away with competitive bidding or performance bonds in awarding contracts in order to step up production. Contracts can be revised without any formality. Only a nod of the Presidential head will do the trick.

LIMITED censorship, of course, has been set up and it will be unlimited if tight clamping down is held necessary to bar information reaching the enemy. It should be said, however, that this power of censorship, according to all present evidence, will be wisely exercised and not used for rigid

suppression of facts which the people of the United States should know. In announcing a partly mandatory and a partly voluntary censorship, the President urged press correspondents not to have bad dreams. Thus he avoided a headache for the press and assured it further by appointing Byron Price, executive news editor of the Associated Press, as director of censorship.

The legislation was patterned after the Overman World War act, but exceeded it in giving President Roosevelt wider controls over war contracts and alien property. There were a few minor restrictions invoked at the suggestion of Senator Taft of Ohio and Senator Vandenberg of Michigan. These barred the removal of profit limitations on defense contracts. Another provision, one of a tongue-in-cheek variety, requires that all acts under the contracting authority shall be publicized under Presidential regulations—and here's the catch—"when deemed by him not incompatible with the public interest."

AGREEMENT to discretionary publication of contracts by the President was voiced by the Senate when Senator Vandenberg referred to them as "a fruitful

LEWIS AND GREEN: John L. Lewis and William Green sat far apart at the President's industry-labor conference, and refused to be photographed together. Left to right, the labor representatives sitting at the table are, John L. Lewis, president of UMW; Joseph Curran, president of the Maritime Workers Union; Philip Murray, president of C.I.O.; Julius Empstak, secretary of Electrical, Radio and Machine Works; R. J. Thomas, president of the UAW; Emil Rieve, president of Textile Workers, and William Green, president of AFL.



Now PRODUCTION Doubled-Trebled

NEVER before in the history of this great country of ours has the demand on industry been so great. It is production—faster, faster, faster! And faster production means systematic production. All work must move along easily, quickly, and efficiently.

American MonoRail Equipment increases and helps speed up production. It also reduces handling costs. It relieves men from lifting and carrying, and enables them to give full time to production. American MonoRail Equipment keeps materials and products on scheduled routes without congestion, delay, and damage in transit.

Standard parts are assembled into complete systems to meet the special requirements of the particular job. Supplied for manual, electric, or automatic operation. No job too small, none too large. No interruption to your production during installation. Let an American MonoRail Engineer show you how to "open the production throttle" in your plant.

THE AMERICAN MONORAIL CO.

13103 ATHENS AVENUE

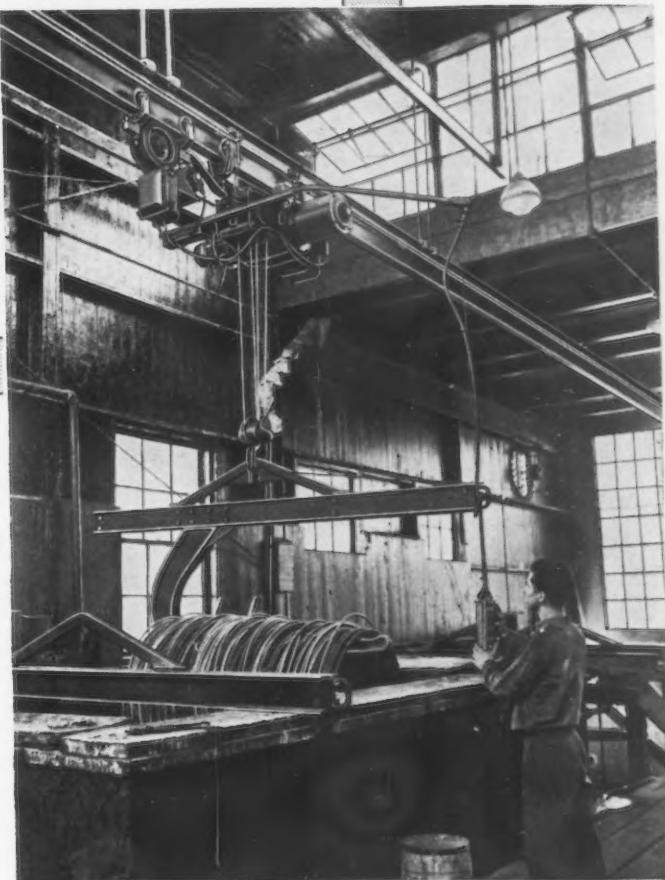
CLEVELAND, OHIO



WRITE FOR Blue Book
illustrating hundreds of
MonoRail installations.

IF YOU *Plan* TO BUILD OR EXPAND ★ ★ ★

The complete facilities of our engineering staff are at the disposal of any company—their architects or engineers—planning to expand or construct new buildings. Through long experience, we are able to cooperate effectively in planning right heights, proper sizes and placement of structural members, and in other ways which result in buildings being designed to fit the needs of the user. This service is yours for the asking.



Finger tip operation of power driven carrier speeds up pickling process.

Free moving crane transfers heavy loads by easy hand operation.



WASHINGTON NEWS

field in which waste and scandal can occur."

In the executive branch also the Walsh-Healey Public Contracts Act was subjected to a little streamlining by Madam Perkins, Secretary of Labor, at the request of the Secretaries of War and the Navy, whose appeals to her in peacetime for loosening up of the act were firmly turned down.

Desiring to speed up production, the heads of the two military establishments asked for and were given an exemption which permits the award of contracts without the inclusion in the contracts of the representation that the contractor is a manufacturer or regular dealer as provided in the act, when such representation can not be made. This means that manufacturers engaged in peacetime work will divert facilities to defense materials and be qualified to accept contracts under the Walsh-Healey Act.

REQUEST for this exemption was made by the Defense Production Association which was

set up by an OPM order. Groups making up the association have facilities which may be used to manufacture defense articles and have agreed among themselves for the use of their facilities for such production, and now are enabled to negotiate war contracts under the act.

Speedier construction of naval vessels also was provided for in legislation rushed through both branches of Congress last week. Meaning more steel and machinery, it calls for a 150,000-ton increase in the Navy and Chairman Walsh of the Senate Naval Affairs Committee estimated that advanced work schedules will enable the Navy to complete heavy ships in two instead of three years and reduce the time on construction of lighter vessels to 18 months from two years. With speedy construction in mind Congress did not include battleships in the same 24 additional ships provided for, although the former may be built at the discretion of the Navy.

THE BULL OF THE WOODS

BY J. R. WILLIAMS



Ferrochromium Subject of Specification Agreement

Washington

• • • Ferrochromium, used in making simple chromium steels containing up to about 3 per cent chromium used for engineering purposes, was the subject of a specification agreement between principal manufacturers in an OPM meeting last week. The agreement to change present specifications of 68 to 69 per cent chromium, to 60 to 63 is an attempt to conserve chromium supplies, 30 per cent of which are threatened by present hostilities.

Entire Machine Tool Group Called to Price Meeting

Washington

• • • Representatives from all companies (479) in the machine tool industry have been invited to a meeting with OPA officials on Jan. 7 to discuss details of a price schedule on new machine tools expected to be issued shortly thereafter, Leon Henderson, administrator, announced this week. The proposed schedule has been prepared after extensive consultation with a representative group of machine tool manufacturers.

Mr. Henderson emphasized that the schedule is not in effect as yet and that no formal action will be taken until after the meeting. New machine tool prices are subject, however, to provisions of a letter sent to the industry on May 6 (re-affirmed on Aug. 18) requesting manufacturers to hold firm prices in effect as of that date.

Price Stabilization of Oven By-Products Asked

Washington

• • • Large steel companies and gas plants which recover benzol, toluol, xylol, and naptha from by-product coke oven "light oil" were requested Dec. 16 by OPA not to increase the per gallon price of these products during the first quarter of 1942 over 1c. more than the price charged in the last three months of 1941. Several of the largest producers had said they were going to raise first quarter 1942 prices an average of 1½c. a gallon on a delivered basis.

Don't Stop Output in Test Drills, OCD Urges

Washington

• • • Test blackouts must not interrupt production of defense industrial plants. Continuous operation was urged last week by the Plant Protection Division of the Office of Civilian Defense following conferences with Army and Navy officials.

"Plants should progressively participate in black-out drills until their plans are workable and satisfactory," the OCD declared. "When the tests are satisfactory, the plants having defense contracts should no longer be asked to participate. In no case should any plant having defense contracts be required to stop production."

Industrial plants should not be evacuated, OCD said. It suggests plants provide temporary places of safety for employees.

(Employees covered by the wage and hour law do not have to be paid for idle time during blackouts or air-raid alarms, according to a ruling last week by Baird Snyder, administrator of the wage and hour division, Department of Labor, Washington).

Girdler Will Head Aircraft Consolidation

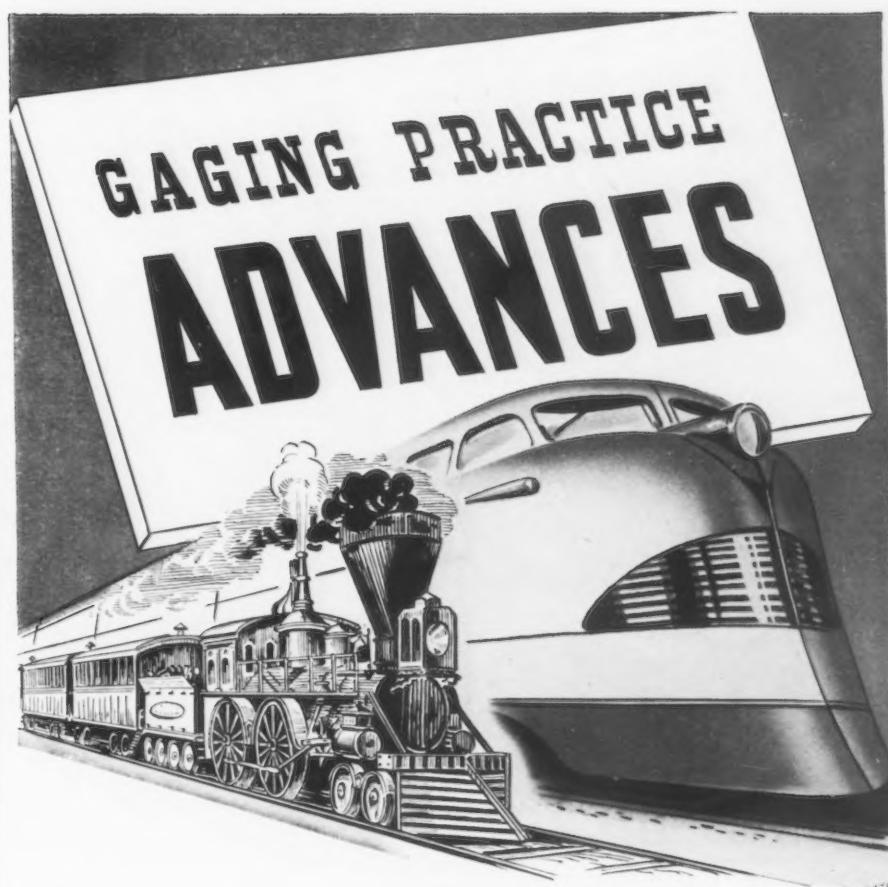
• • • Directors of Republic Steel Corp. have approved the proposal that Tom M. Girdler, chairman of the board, become chairman of the boards and chief executive of Vultee Aircraft, Inc., and Consolidated Aircraft Corp.

"Mr. Girdler will continue as chairman and chief executive officer of Republic, but will spend such time as may be necessary in heading the airplane companies," said R. J. Wysor, president of Republic. "The importance of airplanes to victory in the war is so great that the Republic board is willing to sacrifice a part of Mr. Girdler's time in the belief that he can help speed airplane production."

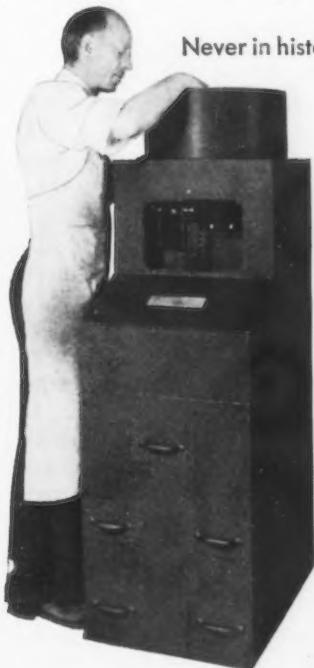
Mr. Girdler has announced he will take the job upon consummation of the transaction by which Vultee is to acquire working control of Consolidated.

Correction

• • • The 128-in. plate mill shown as being plate capacity for Jones and Laughlin Steel Corp. on page 98 of THE IRON AGE, Dec. 11 was dismantled and scrapped some time ago.



Locomotives have improved vastly since those ambitious little wood burners struggled across the Union Pacific in the early 70's. The streamliner of today can do far more and do it much faster.



Never in history has progress been made more rapidly in precision gaging than in the last few years. Both standards of accuracy and gaging speed have made spectacular advances. The human equation, such an unpredictable factor just a few years ago, becomes much less troublesome.

Sheffield has its part in this march of gaging progress. It was Sheffield which produced the automatic gage illustrated—also the Electrigage, the Multicheck Electrigage, the Precisionaire, the Thread Lead Checking instrument and others. If you are not familiar with what these instruments have accomplished in increased accuracy and faster inspection, write us for the story.

THE SHEFFIELD
CORPORATION
Gage Division • DAYTON, OHIO, U.S.A.



WEST COAST...

- Navy awards contract for supplementary construction at outposts
- ... Bonneville power lines guarded ... Scrap price revision a helpful move but violations still are numerous.



San Francisco

DEFINITE confirmation that war will make Uncle Sam tramp on the accelerator harder in building Far Western projects requiring construction steel came last week when a supplementary \$14,000,000 contract for facilities at Kodiak, Sitka and Dutch Harbor, Alaska, was awarded by the Navy to Siems-Drake-Puget Sound Co. Thousands of tons of construction steel, chiefly structural shapes, have been flowing to these air and fleet bases since August, 1939, when the initial contract was taken by this contracting combine composed of Siems Spokane Co., Johnson, Drake & Piper of Minneapolis, and Puget Sound Bridge & Dredging Co., Seattle. The 1939 contract was only the first of a series which has, not including last week's contract, totaled about \$65,000,000, according to Navy announcements.

Before pouring is well under way on foundations for Alcoa's new aluminum reduction plant at Troutdale, Ore., and on the aluminum rolling mill being built at nearby Fairview, Ore., by United Engineering & Foundry Co., increases from the originally announced capacities of these plants are rumored. The reduction plant's capacity would be increased from 90 million to 120 million lb. annual-

ly and the rolling mill's capacity from 60 to 120 million lb. annually. The increased capacities would not mean proportionate increases in total costs of the projects.

THE Bonneville Power Administration's generating, transmission and sub-station facilities, which are to be the key to such a large part of America's aluminum production facilities, were under substantially increased guard last week as a precaution against possible sabotage upon the orders of Administrator Paul J. Raver.

"Effective immediately the guard service of the Bonneville Power Administration will be increased sharply to provide completely adequate protection to the power supply of the Pacific Northwest during the war emergency," Raver stated. "Protection of the power system is being carried out through the cooperation of Bonneville's regular protection unit, under Capt. John Turrish, and other agencies of the Federal Government."

The thousands of miles of transmission network in the great open spaces of the Pacific Northwest, which heretofore have only had to guard against small boys with air guns popping at the insulators, now, with the Los Angeles aqueduct, constitute the chief protection problem of the Pacific Coast.

The Coast steel industry, which one month ago was facing a year of lingering death during 1942, has been given an effective shot in the arm by revision of scrap steel ceiling prices, and revision of remote area regulations which went into effect the last week in November. Although this stimulation of metal flow to consuming centers now makes the outlook brighter than it has been for months past, Coast mills, which operate almost completely on scrap, with one small exception, are not optimistic for the long run.

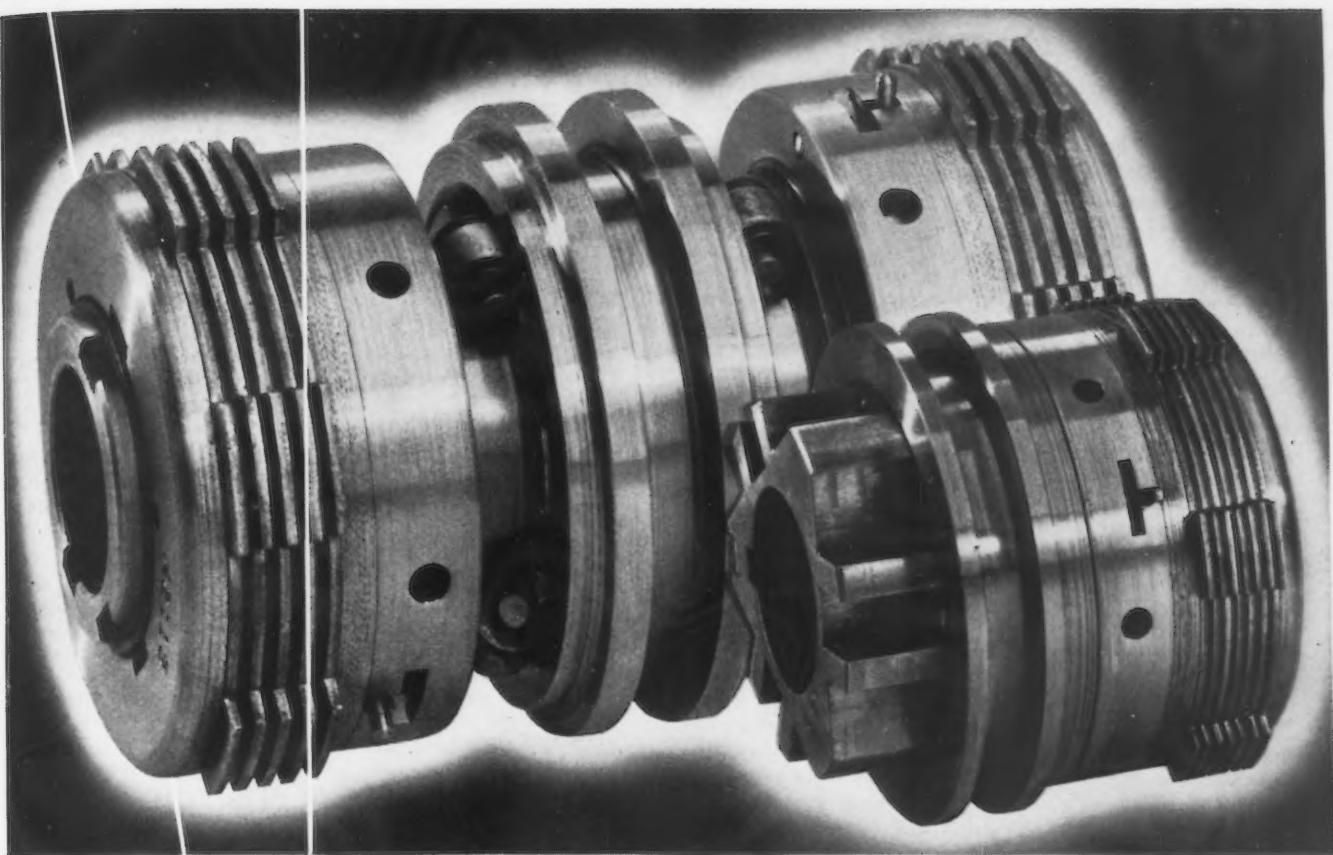
REMOTE areas in northern California and Oregon, particularly, have disgorged substantial tonnages in the month they have been out of price quarantine. The big question mark, and possibly the key to continued capacity operation on the Coast until new pig iron production facilities can be made effective, lies in determining what proportion of the remote scrap

will be recurrent. In normal times, approximately three-quarters of Coast scrap originates from junked automobiles in metropolitan areas, and this source, aided by increased new car registrations six years ago, should continue to furnish a constant if not increasing supply. The remote scrap, however, originates to a great extent from mining, lumbering, and agricultural operations which, once junked, are gone. Though obsolescence will continue to make available some scrap from these fields, the supply which is just now being made available represents an accumulation over a period of many years, and in no one year to come, of course, will such large amounts be produced.

The rate of scrap recurrence from railroads and petroleum producers has also dropped sharply, they, unable to easily obtain new equipment, are rehabilitating rather than scrapping.

No single part of the OPA price revision last month was as helpful as the ruling opening up the State of Oregon as a remote area in which the \$5 premium could be paid. During the period of heavy Japanese exports, scrap tonnages taken out of Oregon were all out of proportion to the size of its metropolitan centers, indicating that country scrap was being taken in substantial quantities. Another contributing factor may have been that Oregon has no steel capacity, and the Japanese found less competition for scrap. It is generally believed that the Japanese far from cleaned out the State. The largest single nest of scrap on the Pacific Coast, 20,000 tons, was held in Portland.

THE reputation of the Pacific Coast as the black spot of America in violations of the iron and steel scrap schedule, which led to the first branch OPA enforcement office in the country being established in San Francisco, has improved substantially. Violations in prices set for foundry grades, particularly in southern California, are still numerous, however. Mills, as a group, have been keeping their skirts clean, but some violations are still reported. No diminishing of the enforcement problem is to be expected, however, as long as the supply situation remains so acute. Some further adjustment of OPA regulations might afford further slight relief, and it is quite probable that they will be made.



"Keeping step to the tune of "faster work cycles"



IN MODERN machine tools, where work cycles are figured in fractional seconds, one "laggard" part can lower the efficiency of the whole unit — one accessory "out of step" can materially retard production. A clutch that requires excessive pressure, or one that is slow to release, may increase the time of the work cycle as much as 10% to 20%.

A feature of Twin Disc Machine Tool Clutches is their high torque characteristics with comparatively low pressures . . . a result that is possible only by the use of precision methods at every point in the manufacture and the close control and accurate grinding of the materials used for the friction discs.

A ROLL CALL OF THE MACHINE TOOL BUILDER'S ASSOCIATION shows that 9 out of 10 are customers of the Twin Disc Clutch Company—a significant tribute to Twin Disc Machine Tool Clutches.

Twin Disc Machine Tool Clutches are furnished to operate dry or in oil, both in single and duplex types, in sizes from 2½" to 12". Each has its specific application. Ask our Engineering Department for recommendations.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

REG. U. S. PAT. OFF.

TWIN DISC CLUTCH COMPANY • 1370 RACINE STREET • RACINE, WISCONSIN

Fatigue Cracks

BY A. H. DIX . . .

They Give Their All

• • • Hollow-eyed and jittery is how the members of the brains department look and act this time of the year, what with getting out the regular weekly issues and working on the big Annual Number besides. Just about now they always seem to be on the verge of a n.b. and every year we are afraid that several of them will start foaming at the mouth in unison during working hours and the big book will never come out. But they always just make the grade.

In the hope that we could tip you off on what will be in the Annual we have been nosing around the brains department, and several times we have had our courage screwed up to the point of putting the question point-blank. But the brainworkers are so busy every time we step into their offices and scowl so much that we lose heart. Yesterday noon, however, we had the good luck to encounter one of the stenographers at the water cooler and from what we picked up we feel safe in saying that the big book is going to knock you for an Immelmann.

You May Get It Late

• • • We would like to register an advance apology for possible late delivery of the Annual. Thursday, the date of issue, is New Year's Day, which loses a day for us at the start. Then it is a big book to print, 566 pages; we have to wrap each copy in a corrugated board container, and we have to print more copies than ever before, as the one big, more or less happy family has never been bigger.

We'll try hard to meet our mailing schedule, but if we fail we'll be sorry.

Locomotive Lice

• • • John Gibbons of the Automobile Manufacturers Assn. told Bill Sherman to tell us to tell you that cooties are now being referred to as mechanized dandruff.

One Orchid—To Go

• • • A pat on Tidewater Oil's backbone for this sparkling simile—"Parts used to tarnish like a carnival watch."

All God's Chillun Are Aryans

• • • We see that the flap of the exclusive Aryan tent has been lifted to admit the Japanese. A Rome commentator establishes a new ethnological broad jump record by classifying the Japs as "yellow Aryans," and at the same time proves that the helve is more generous than the head of the axis. You will recall how annoyed the Nazis were when Jesse Owens kicked the Nordic superiority theory flush in the teeth by running away with most of the track events at the last Olympics.

If the games had been held in Italy instead of Germany the contretemps would have been neatly avoided by making Negroes Nordics for the duration of the games.

Bones and All

• • • We are fond of telling advertisers and ourselves that you and the rest of our loving readers devour each issue in its entirety, like a Kansan at his first clambake. This may be more of a wish than a fact, but the letters we get, commenting upon even the slightest departures from the norm, convince us that the element of truth is large. For instance:

A recent American Steel & Wire Co. ad referred to "the drafting of rods into wire." "What," writes L.E.R., "is the difference between *drawing* and *drafting*?" If there is no difference I suppose a selective service soldier might be called a 'drawee'." Correct. There is no difference. The words are synonymous in most of their

applications. L.E.R. may, for all we care, call a draft board a draw broad.

Boot for Foot

• • • And an anonymous reader in Providence, R. I., calls attention to a peculiar typographical error in an item concerning an executive of the Foote Brothers Gear & Machine Co. The item itself was correct, but a quirk in the mind of the lino operator caused him to make the caption under the accompanying photograph read "Boote Brothers Gear & Machine Co."

Value for Valve

• • • The same kind of a "thought association" typographical error appears in a recent issue of the OPM publication, *Defense*. The name of the Cash Valve Mfg. Co. appears as the "Cash Value Mfg. Co."

They Shot the Works

I am now reading "A Gunner Aboard the Yankee," the story of the New York Naval Reserves in the Spanish-American War, and have just finished the part that tells of a conversation following a furious bombardment of Santiago de Cuba, which occupied an entire afternoon. This is the conversation:

"I have been figuring on the cost of the fight," remarked Hay, and he then detailed the number of shell fired, including 'about a million' six-pounders.

"Hardly that," smiled Tommy, "but we expended enough to bring the total cost up to \$18,000 at the very least. War is a costly thing, boys."

At this point I broke down and wept bitterly.

—Deac

Aptronyms

Here's one for your names-that-sound-like-the-job department. The *Better Homes & Gardens* representative who calls on me is named—guess what?—Holmes.

—Bill (Armco) McFee

An anonymous contributor informs us that an employee in the Fansteel Metallurgical Corporation's tool department is happily named Rehmer (pronounced reamer).

A Charleston, S. C., ornithologist is named Sprunt, which seems to us to be just right.

We inquired here recently whether the Butt Welding Co., Detroit, was started by a Mr. Butt or whether it specializes in butt welding, and through the mails have just received a calling card bearing the name of E. L. Dunn, who is with the Butt Welding Co., which the card says does "High Speed Steel Welding and Blanchard Grinding," but no mention of butt welding or of a Mr. Butt, so we still haven't struck an arc.

If there are any welding shops in Lapland one of them is almost sure to be called the Lap Welding Co.

Stopper

• • • Can you drown a motor?—Allis-Chalmers.

Puzzles

Last week's courier traveled 96,568 miles.

Walter H. (Babcock & Wilcox) Andresen takes the rap for this one. It seems to us there is something screwy about it and we would like to hear from the master minds:

A man pulls himself up the side of a building in a bos'n's chair. Man weighs 150 lb. Single rope goes through a sheave which is attached to a horizontal beam. The beam will support 275 lb. When opposite a fire escape he ties rope to railing. He then tries to climb from chair to fire escape but beam breaks and he falls to ground. Why did beam break?

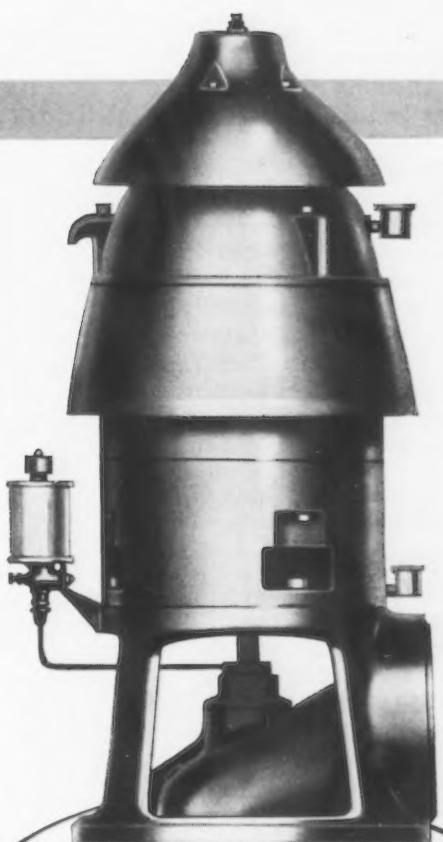
To each member of this page's loyal army of eighteen readers, a Merry Christmas!

HOW TO INCREASE PRODUCTION WITHOUT USING MORE POWER . . .

IF YOUR pumps are not of the latest, improved designs, they are probably wasting power which you could use profitably to increase plant capacity.

Ten-year-old pumps of certain types, even if as good as new, take a 25% greater toll at the power meter than today's Fairbanks-Morse models. And 3- or 4-year-old pumps of other types consume so much more power than current models that continued use is not only more costly than replacement, but is intolerable because it dissipates vitally needed power resources.

Before arranging for increased power supply, take every practical step to eliminate power waste. A Fairbanks-Morse Pump Engineer can tell you quickly, without cost or obligation, whether your pumps are the types which waste power . . . which carry such heavy obsolescence penalties that new pumps would pay for themselves in as little as a year. Find out now. Write Fairbanks, Morse & Co., Dept. L-38, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.



FAIRBANKS-MORSE TURBINE PUMPS

Complete range of capacities (35 g.p.m. to 4000 g.p.m.) for electric motor, Diesel or gasoline engine, or steam turbine drive. Open or closed impellers, oil or water lubrication. Today's 6" F-M Turbine is 23% more efficient than the same size was in 1927; today's 10" turbine is 21% more efficient than the 10" pump was in 1927!

FAIRBANKS-MORSE PUMPS

DIESEL ENGINES ELECTRICAL MACHINERY RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
MOTORS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

This Industrial Week . . .

PRESSURE for increased production of war materials and equipment from American plants this week was reaching levels which are already making the pre-war (before Dec. 7) efforts look unimpressive by comparison.

Typical of the new production goals being set as a result of U. S. entry into a shooting war is that of the machine tool industry. Long under forced draft because of its strategic position in the flow from raw materials to ships, tanks and planes, the machine tool makers are now being asked to lift production 50 to 100 per cent.

Those figures apply specifically to machine tool plants manufacturing for the airplane, anti-aircraft and machine gun industries, but the entire machine tool industry is now being asked for an increase in production.

Huge Purchases of Tools Coming

W. H. Harrison, OPM's director of production, told machine tool groups meeting at Washington last week with the OPM that \$1,125,000,000 to \$1,750,000,000 would be spent for tools in 1942. The machine tool men were told, when they pointed out the increased costs arising from farming out of orders, that "in an emergency, when we need something, prices are a secondary consideration." OPM Chief Knudsen said that the OPM would be reasonable and would create "a price of adjustment" in meritorious cases.

Wide Powers Given President

Emphasizing the speed with which industry is being converted to a war-time basis, steel manufacturers estimate that within the next 60 days, as much as 90 per cent of production at some large plants will be earmarked for war use. Projected shipping schedules for December indicated that 68 to 70 per cent would go for war needs, figures which are being changed by Pearl Harbor.

Nothing has demonstrated more fully the speed with which industry is being pushed toward total output for war—a still distant goal—than the quick action by Congress granting great emergency powers to the President, permitting him to do away with competitive bidding and performance bonds in awarding contracts to stimulate production.

At the same time the War and Navy Departments were finally granted exemptions in the Walsh-Healey Public Contracts Act which permit the award of contracts without the inclusion in the contracts of the representation that the contractor is a manufacturer or regular dealer as provided in the Act, when such representation cannot be made. This step will help in the diversion of plant facilities to war materials.

Navy Expansion Speeded Up

Chairman Walsh, of the Senate Naval Affairs Committee, estimates the advanced work schedules, made possible by the 150,000-ton Navy expansion voted by Congress, will enable the Navy to complete certain heavy ships in two instead of three years and sharply reduce the time of construction on lighter vessels.

On all sections of the industrial front are signs that the U. S. at war is little like the U. S. at peace.

News that the auto-aviation industry program for production of bombers is months ahead of schedule came in an announcement from the Office of Production Management that the first Army bomber assembled from parts fabricated by the automobile industry will roll off the line of the new North American Aviation plant in Kansas City early in January.

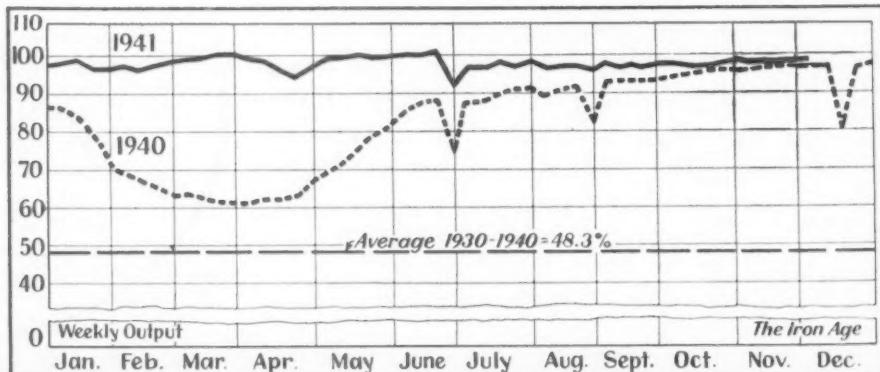
For another week all the emphasis has been on great war production, with the needs of peacetime plants unable to get materials or defense orders, still largely overshadowed by the demands of war. Effects of the war so far on the farm equipment industry, reviewed elsewhere in this issue of THE IRON AGE, suggest that this industry faces a very sharp decline in production but that the need for increasing food production of U. S. allies complicates the problem and may enable farm equipment makers to escape with a 1942 output cut of only 20 per cent.

War Orders Boost Steel Backlogs

Progress in the conversion of peacetime plants to war production is reported on many sectors, particularly in the automobile, electrical supply and washing machine industries. Washing machine makers are manufacturing machine guns. Vacuum cleaner manufacturers have been converted to small fittings of all kinds. Safe and lock companies have started to make gun parts and calculating machine companies are now engaged in the pro-

Steel Ingot Production—Per Cent of Capacity

(Open Hearth, Bessemer and Electric Ingots)



Steel Ingot Production, by Districts—Per Cent of Capacity

	Pitts- burgh	Chi- cago	Youngs- town	Phila- delphia	Cleve- land	Buf- falo	Wheel- ing	De- troit	South- ern	S. Ohio	West- ern	St. Louis	East- ern	Aggre- gate
Current Week	88.0	104.0	88.0	89.0	99.5	90.0	82.0	107.5	95.6	105.0	95.0	94.0	104.0	93.5
Previous Week	97.0	103.0	97.0	90.5	100.0	90.0*	86.0	106.0	98.5	103.5	97.0	108.0	109.0	97.5

duction of shell fuses and fitting pins. Details of the automobile industry's large-scale efforts at war production have been widely publicized. To hasten the conversion of civilian plants, the OPM has placed the Division of Civilian Supply and the Purchases Division, formerly responsible to Leon Henderson (OPA head) under direct charge of OPM Director General William S. Knudsen.

Despite the virtual stoppage of non-defense orders for steel, incoming defense orders for vital war use are lifting December bookings slightly above orders for the corresponding period of November. The necessity for adjustments in the priority and allocation set-up grows every day, with orders for military projects reported blocked by orders for less essential use which up to now have been entitled to high priority ratings.

New Group to Map Streamline Plan

Allocations of plates have been more effective in recent weeks, and the steel industry believes that the new Adams group should facilitate the flow of steel output toward the more vital war channels. Selection of seven general consultants and two special advisers from the steel industry as members of the staff of C. E. Adams, newly appointed chief of the OPM's iron and steel branch, is expected to streamline the steel distribution system.

The steel industry this week is foregoing, to a great extent, the usual Christmas shutdown to avoid any unnecessary loss of vital steel supplies. Ingot operations for the current week are estimated by THE IRON AGE at 93.5 per cent, a decline of four points from a week ago. Had the holiday been observed as in the past, the rate would have declined 15 to 20 points. In the Christmas week of 1940, the rate dropped 17 points.

The Christmas Day practice in all districts is not identical, due, in most cases, to local conditions. A number of large plants are planning to keep all open hearths running, while other companies are taking off a few furnaces. Aside from the holiday influence in the week's rate, the scrap shortage was also a factor in curtailing operations. Several districts reported lower rates this week due exclusively to lack of scrap.



EXPLOSIVE MANUFACTURE: At this munition factory in the Netherlands East Indies at Bandoeng, native workman mix the explosive charge for shells by hand.

The only large area to show a rise this week is Chicago, which reports a gain of one point to 104 per cent. Both Youngstown and Pittsburgh are down 9 points this week to 88 per cent. Philadelphia declined 1½ points to 89 per cent, Cleveland was off a half point to 99.5 per cent, Wheeling dropped 4 to 82 per cent, the South declined 2 to 95.6, the West lost 2 to 95, St. Louis declined 14 to 94, and the Eastern district eased 5 points to 104. Buffalo was unchanged at 90, while Detroit gained 1½ points to 107.5.

Knudsen Pleads for More Scrap

Iron and steel scrap suppliers face their sternest test—the question of whether enough material can be found to sustain steel mill and foundry operations during the critical winter months. Reports from principal market centers show that shipments are declining as the cold weather delays shipments and

as plants manufacturing consumer goods reduce production.

To stimulate the OPM's industrial salvage program, OPM Director Knudsen issued an appeal to every industry to gather every pound of old metal because "in this shooting war our planes, tanks, ships and guns have an enormous appetite for metal."

War Production Must Go On

While industry in the Midwestern states, far from the furor of the possibility of bombing raids on the West and East Coasts, looked lightly at the problem of blackouts, the Office of Civilian Defense, supported by Army and Navy officials, warned that test blackouts must not interrupt production in defense plants. The OCD said:

"All industrial plants should progressively participate in blackout drills until such time as they have demonstrated to the responsible local authorities that their plans for blackout are workable and satisfactory. When the tests are satisfactory, the plants having defense contracts should no longer be asked to participate. In no case should any plant having defense contracts be required to stop production."

Pennsylvania producers were asked in telegrams last week by Price Administrator Henderson not to sell blast furnace beehive coke in excess of \$6, ovens, to the ultimate consumers, effective Dec. 15.

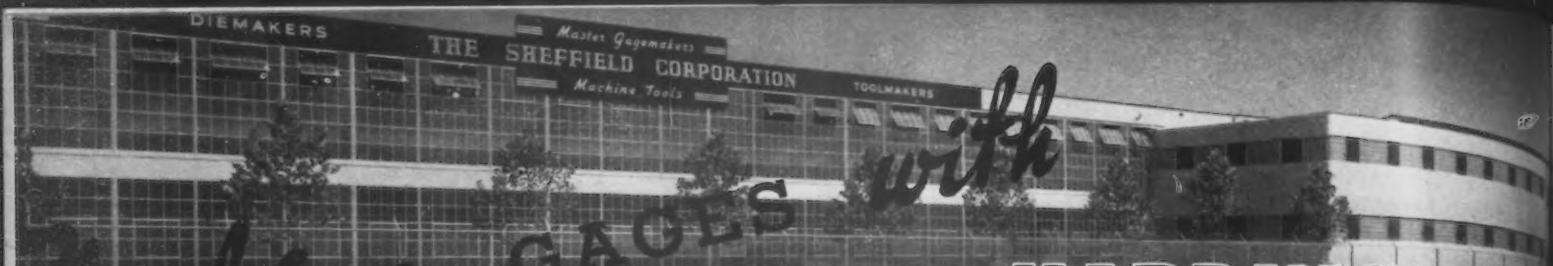
This action, the OPA said, was taken to forestall a 25c. increase in price of beehive coke in Western Pennsylvania.

The OPA is now gathering data preliminary to the preparation of a schedule of ceiling prices for bolts, nuts and rivets.

Pittsburgh

• • • Authoritative information indicates that before war was declared on Japan and other Axis members, projected steel industry rolling mill schedules for December reflected an output of rated tonnage amounting to slightly more than 68 per cent of anticipated total steel shipments.

The entire outlook has changed drastically and it is believed that close to 90 per cent of steel production in the next few months will be devoted entirely to rated or allocated tonnage.



making

GAGES

HARDINGE

HIGH SPEED PRECISION LATHES

Extreme precision is vital in the manufacture of gages. Because of this fact, the Sheffield Corporation, Dayton, Ohio, like their HARDINGE High Speed Precision Lathes with preloaded ball bearing spindle construction.

Read what Fred Markwick, Gage Manufacturing Manager of the Sheffield Corporation says:

"Hardinge Precision Lathes do an excellent job. They are very dependable and accurate."

A partial list of the precision gages manufactured by the Sheffield Corporation is:

Visual Gages; Electricheks; Multicheks; Precisionaires; Guidegages; Thread Gages, Plug, Ring, Snap Gages; Special Gages; Spline and Serration Gages; Thread Lead Checking Instruments.



HARDINGE BROTHERS, Inc. · · · ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



Farm Equipment

Industry Weighs

Effect of War Cut

Chicago

• • • Whether the farm equipment industry will escape with only a 20 per cent cut in production in 1942, or whether it will be slashed to the bone is being argued by industrial men here. One of this area's three biggest steel consumers—along with railroads and automobiles—the implement industry, used about 1,500,000 tons of steel in the past year and would like to have this or even 300,000 tons more in 1942; though even its most optimistic supporters believe it will be fortunate to get off with about 80 per cent of its 1940 production rate.

Some steel men here feel that the manufacturer of new farm implements is slated for the greatest squeeze in its history in the coming year. The most pessimistic predict a cut as great or even greater than that which is expected eventually to hit Detroit. Their argument is based on the fact that the two biggest steel requirements for implements are bars and sheets, these two alone accounting for 600,000 tons of the total of 943,000 tons consumed in 1939. They contend that bars will not be available because of the enormous

demand for shells and that sheets will be squeezed out to provide raw steel for other armament products.

Other steel men here believe the farmer will find equipment available in 1942 in volume within striking distance of that produced in 1940. (Production in 1941 was about 130 per cent over '40). This second thesis is based on (1) the fact that the farmer will need equipment to produce the food for war and that the government will therefore grant the necessary materials; and (2) on the fact that the size bars, for instance, needed are smaller than those which will be required for shell steel; and that (3) cold reduction mills must be operated in some degree in 1942 which will provide implements the kind of steel it needs.

Though a 1942 figure of 80 per cent of 1940 production would be a sharp drop from 1941—an all time record-breaker—it is still perhaps too optimistic. Around Dec. 17, 1941, International Harvester Co., biggest in the industry, dropped from a five-day to a four-day week. The step affected about 30,000 out of a total of 50,000 employees and 11 out of 18 plants.

Although the work schedule re-

News

of

Industry

• • •

duction may have been made as a precautionary move, it is not considered likely. Factors involved in the whole picture can be obtained quickly by the figures shown in the table.

Both government farm bureaus and equipment makers believe that OPM will set 1942 production near the 1940 level for the reasons that more food will be needed, that there will be less farm labor available and that more equipment will be needed to fill the void. Farm labor has been decreasing steadily since the last war. Over half of those lost to the farms in World War I were never replaced; this

	Steel Consumed (Thousands Net Tons)	Farm Equipment Prod (Millions)	Farm Income (Millions)	Farm Labor (Millions)
1939	943	\$473	\$8,581	10,600
1940	1,000	561	9,100	10,300
1941	1,500 (est.)	675 (est.)	10,200	9,850
1942	1,500 to 1,800*	448 (est.)**	10,500	9,400

*Farm Equipment Institute estimate.

**Depending on government production order and materials available.

A Steel-Encased

"BLACKOUT" PLANT

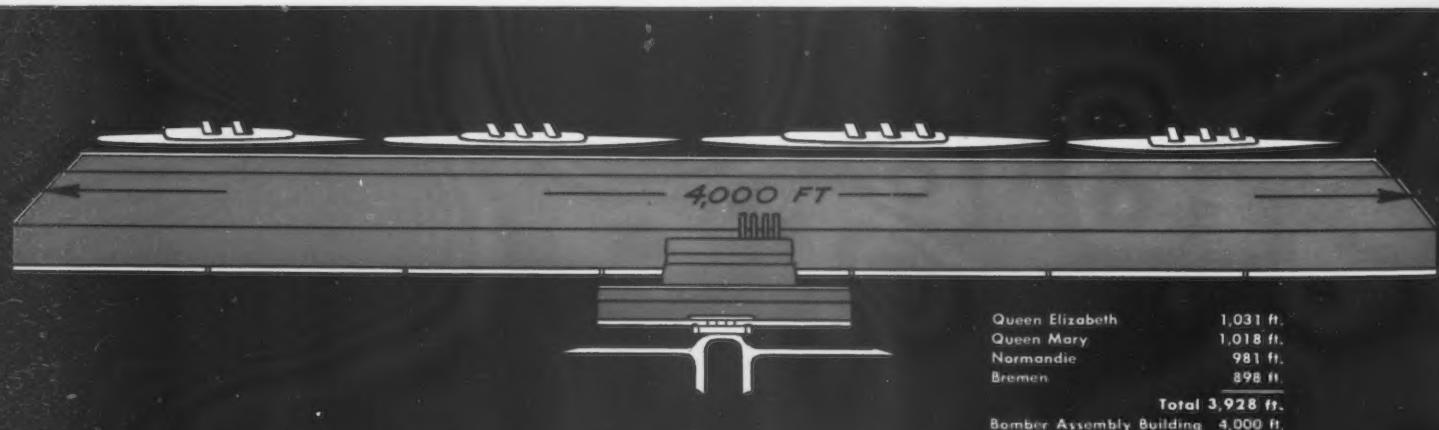
This mammoth Bomber Plant at Fort Worth, to be operated by Consolidated Aircraft Corp., is a noteworthy Defense Project because of new developments to be found in the design employed and because of its tremendous size . . . 4000 ft. long.

NEW TASKS FOR STEEL—For men in "steel" this plant has special interest because of the extent to which steel has been utilized in providing a shatterproof, splinter-proof and incombustible type of construction with over 38,000 tons in structural members, in sidewalls and roof, in doors and as reinforcing.

STEEL TEAMS UP WITH GLASS—Unique in design is the sidewall and roof construction developed by Austin Engineers in which steel and glass have been effectively combined to provide insulation against heat and cold and to prevent condensation and resulting corrosion; also to control noise by absorbing 60 to 70% of sound.



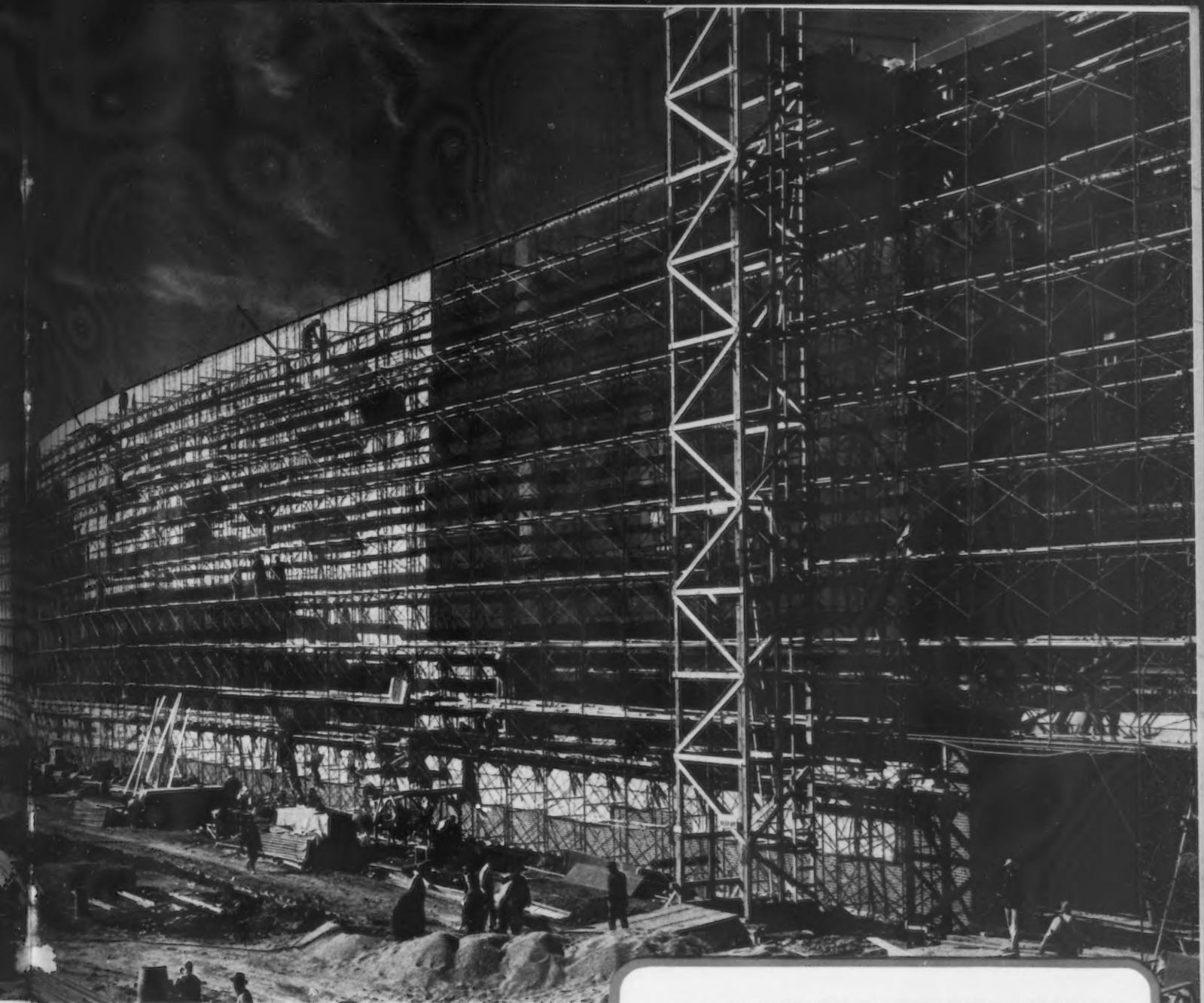
Right above—A "Controlled Conditions" Plant, one of 11 designed by Austin since 1930, in which light, atmospheric conditions and noise are controlled—with uniform working and operating conditions maintained 24 hours a day.



Fort Worth "Blackout" Assembly Building with "Controlled Conditions" is longer than World's Four longest ocean liners.

Below—Construction reaching halfway mark . . . on schedule.





FAST SCHEDULES—Construction was pushed day and night 7 days a week, one result: 27,000 tons of structural steel were erected in 80 working days.

The Fort Worth Plant is being handled by Austin under contracts covering design, construction, installation of building equipment and in this case even installation of production machinery.

Austin will gladly furnish suggested designs and cost estimates promptly.

* * *

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CHICAGO

HOUSTON
SEATTLE
OAKLAND
LOS ANGELES
TORONTO, CANADA

PHILADELPHIA
INDIANAPOLIS
ST. LOUIS
WASHINGTON

FORT WORTH BOMBER PLANT

Where steel provides shatterproof, splinter-resistant and incombustible construction

Principal Buildings

Assembly Building	320' x 4000'
Mezzanines, 16 Areas each	31' x 450'
Administration Building,	
2-story	60' x 700'
Lobby	65' x 65'
Hangar	200' x 850'
Camouflage Building	150' x 300'
Maintenance Building,	
2-story	80' x 350'
Cafeteria Building	125' x 150'
Boiler House	80' x 350'

Total Floor Space 1,926,500 sq. ft.

Steel Required

Structural Steel	27,000 tons
Steel sheets in Walls and Roof	4,500 tons
Reinforcing Steel	6,000 tons
Steel in Doors	1,000 tons
Total 38,500 tons	

Doors in Plant

9—200 ft. vertical lift doors
4—150 ft. vertical lift doors

Mezzanine Floors in Plant
In the 125 ft. side aisle, double deck mezzanine floors, 30 ft. wide, run the length of the building except for 50 ft. breaks at transfer points every 500 ft.

Below—All windows eliminated yet 203 carloads of fiberglass used for insulation.



labor loss has brought steadily rising equipment purchases from the farmer. As another reason for maintaining production in '42 and '43, it is cited that purchase of equipment always lags a year behind loss of labor—and that the next two years will thereby see the greatest demand and possibly need for new equipment.

Resting on the assumption that war demands for food would protect the industry, farm equipment makers have only lately become disturbed about the threat to their production.

There is no way of accurately weighing the true status of the industry as regards the farmer's real needs. It is doubtful whether inventories are sound enough to carry even basic needs for the next six months. The question of whether the steel needed is the kind that could not be used for armaments is something on which steel men are not agreed. No one can actually say whether the farmer could get by in '42 with his present equipment, so long as he was assured of necessary repair parts.

One thing, though, does seem certain. The implement industry will be cut in '42 in production and employment—and rather sharply, probably much more than the 80 per cent figure. The other certainty is that the industry as a whole is well fixed to absorb much of the losses by armament work. This is especially true of the bigger companies, virtually all of whom now have large contracts—in fact over 37 per cent of the contracts placed by this district's ordnance office have gone to implement companies. J. I. Case, Deere, Harvester, Caterpillar, Minneapolis-Moline, Allis-Chalmers and the other leaders are all busy on war contracts. In fact, about 40 per cent of the industry is represented by tractor production, of which practically all can be classed directly as contributable to some phase of war needs.

Willard Elected to Steel Institute Board

• • • Leigh Willard, president, Interlake Iron Corp., has been elected to the Board of Directors of the American Iron and Steel Institute, it was announced today by the Institute.

1942 Metal Show to Be Held at Detroit

Cleveland

• • • The 24th National Metal Congress and Exposition will be held in Convention Hall in Detroit, Oct. 12 to 16, 1942, announces W. H. Eisenman, managing director of the Metal Show and secretary of American Society for Metals, sponsors of the Show.

New York Contract Office Will be Open Sundays

• • • W. O. Crabtree, district manager, Contract Distribution, Division of OPM, announced last week that the New York office at 122 East 42d Street, will be open seven days a week to interview small manufacturers and give them assistance in securing prime or sub-contracts.

PLASTIC SHELL NOSES: A new plastic that is strong enough to be substituted for aluminum in anti-tank and anti-aircraft shells has been developed at Westinghouse Research Laboratories. This is how the new plastic nose fits on the anti-tank projectile, and the shell on the table is an anti-aircraft shell.



22 Million Tons of Steel For Civilians, OPM Says

Chicago

• • • A report on supplies of vital metals was given to a priorities clinic here by Dr. Harvey Anderson of OPM. Here it is:

STEEL—OPM expects production in 1942 of 82 million tons of ingots, equivalent to about 57 million tons of finished steel, of which about 22 million tons will be available for civilian needs. (This figure for civilian needs is more optimistic than steelmen privately predict).

MAGNESIUM—With 1941 production at 60 million lb. and 1942 requirements for incendiary bombs and flares estimated at 80 million lb., it was revealed that new production sources are not ready to meet this demand. Aluminum is the best substitute but there is an equally tight squeeze on that metal.

NICKEL—Output is 17 million lb. per month, far short of armament requirements for 1942.

ALUMINUM—By March, 1942, production will be raised to 70 million lb. a month. More production capacity will come in late in '42.

COPPER—Inadequate supply based on next year's production of 1,700,000 tons domestic and 500,000 tons imported. OPM is considering raising prices or subsidizing high cost producers in Arizona and Michigan as a means of increasing production.

ZINC—Expected supply next year is 978,000 tons. Because zinc and copper are needed to make bronze cartridge cases, many uses of zinc are being curtailed.

LEAD—Insufficient supply for batteries, which means a reduction in supply available to make tetraethyl lead for high test gasoline.

RUBBER—A 10 month's supply is on hand.

New Contract Office Open

Washington

• • • OPM's Contract Distribution Division last week opened a field office in the Financial Center Building, Oakland, Cal. W. P. Collins is acting manager.

Hansgirg, Magnesium Reduction Engineer, is Detained By F.B.I.

San Francisco

• • • Magnesium production at Henry J. Kaiser's huge Permanente Canyon plant will suffer a serious setback if the F.B.I. continues to detain Dr. Fritz J. Hansgirg, consulting engineer and developer of the reduction process on which the plant is based, according to Harry P. Davis, superintendent. Hansgirg was arrested Dec. 17 on unspecified charges.

"The loss of Hansgirg at this critical time is seriously felt by us as we are cutting in the second unit of the magnesium plant. If deprived of his services any length of time we would suffer a serious setback," Davis said, adding that the company would give Hansgirg full support. Hansgirg left Austria in 1931 and went to Manchuria, where he superintended the construction of a small magnesium plant. Coming to America, he last year sold rights to the magnesium reduction process to Kaiser interests for a reported \$750,000. The process was described in the Aug. 28 issue of IRON AGE. Kaiser officials spiked a rumor the process was proving unsuccessful, stating it is more than meeting expectations. The first unit of the plant has been operating since August. One additional unit is now being brought in and schedule calls for one more unit per month for next six months. Each unit is producing twelve tons daily.

Snyder Named Acting Wage-Hour Administrator

• • • Baird Snyder has been named acting administrator of the Wage and Hour Division, by Secretary of Labor Frances Perkins. Mr. Snyder, a former deputy administrator, will head the division until further notice.

Nickel Plate Buys Diesels

• • • Nickel Plate Railroad awarded contracts recently for ten diesel switching locomotives. Six will be furnished by American Locomotive Co., Schenectady, N. Y., and four by Electro-Motive Corp., LaGrange, Ill.



CLOSED SHOP IN CAPTIVE MINES: The signatures of Harry Moses, right, head of three captive coal company subsidiaries of the U. S. Steel Corp., and John L. Lewis, UMW president, to the contract before them marked the end of miner freedom in captive coal mines. The agreement gives the UMW a union shop in the company's mines.

Decision Permits J. & L. Dividend Payments

Pittsburgh

• • • A stockholders suit contesting a capital reorganization plan of the Jones & Laughlin Steel Corp., which held up payment of dividends on the new common stock of the company, was dismissed here last week by Federal Judge P. F. Schoonmaker. Judge Schoonmaker said the company's financial history showed that six of the past ten years of operation were unprofitable and he agreed with the company that a large working capital should be held available for future operations rather than be paid out in dividends. The suit contended that holders of the old 7 per cent preferred stock should have been paid arrearages of \$45 a share before common stockholders were paid.

Army Builds Railway For New Shell Plant

Ogden, Utah

• • • The Army will build and operate a 50-mile railroad system connecting the new Utah general depot, a 37-mm. shell and bomb loading plant, with main lines.

Approximately \$2,000,000 will be spent on this project and other military rail connections in the region.

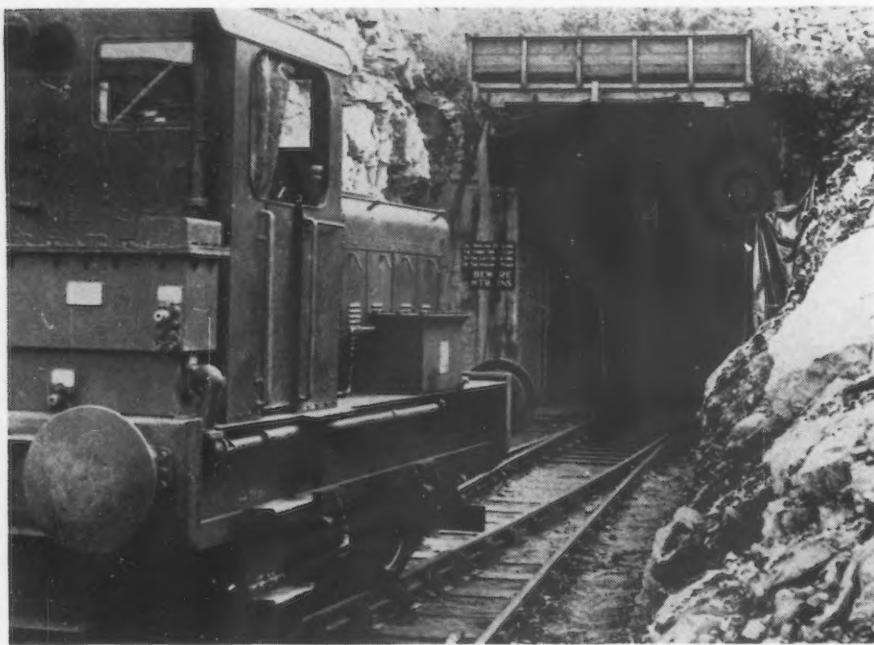
Lend-Lease Steel Needs Likely to Get Sharp Boost

Pittsburgh

• • • It is reported on good authority that lend-lease requirements are likely to be doubled during second quarter of 1942. Such a move, running concurrent with a tremendous step-up in domestic war requirements, would solve once and for all any lingering doubt as to the fulfillment of non-essential steel requirements for some time.

More than 750,000 tons of ingots and semi-finished steel have already been allocated for lend-lease consumption during the first three months of next year. The allocations were made among 15 steel companies.

While tentative schedules had been set up for 700,000 to 800,000 tons of raw steel to be shipped to lend-lease customers the second quarter of 1942, this total may now be boosted to between 1,400,000 and 1,800,000 tons. Such a distribution if it is effectuated, will mean that additional domestic requirements for war purposes, for the production of plates, munition steel, etc., will have to come from the general steel reservoir, thus pushing back delivery on lower rated tonnages and hastening the day of all-out allocation.



BOMB STORE: "Keeping the powder dry," has lost its meaning since this war started. This is the entrance to an underground bomb store in England, served by a full gage railroad. Bombs are safe here from aerial attacks by the enemy.

ASM Moves to Assist Firms Working on War Items

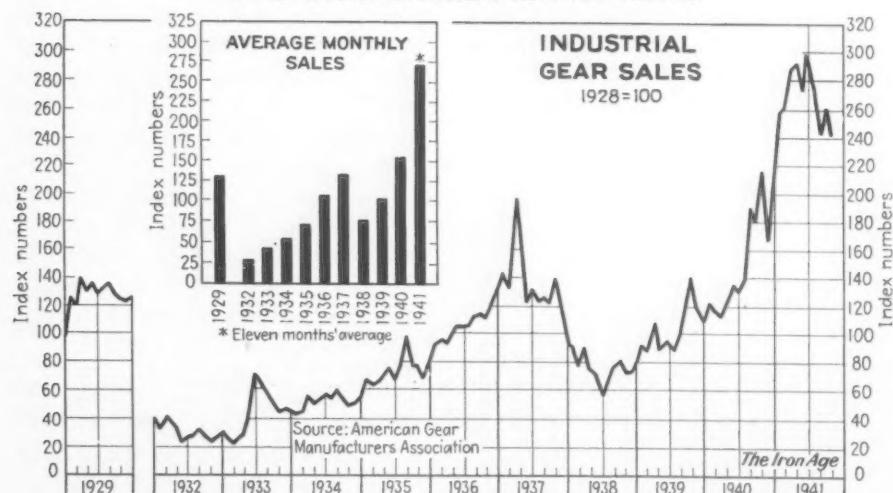
Cleveland

• • • The extensive technical knowledge represented in the membership of the American Society for Metals will be available free to companies working on war items involving metals, under a plan announced by W. H. Eisen-

man, secretary. He stated ASM local committees will be ready to provide answers to technical questions relating to both the manufacture and fabrication of metals.

Plans provide for meetings with representatives of companies having technical questions. Where possible, such questions will be considered in advance of the meetings to permit the fullest possible consideration of each problem.

Gear Sales Decline in November



• • • Sales of industrial gears, as reported by the Gear Manufacturers' Association, continued to decline in November, touching, in that month, the lowest level recorded since December, 1940. Despite the sharp drop in 1941 from the peak of 299 reached in June, the volume of sales for the first 11 months of the year show a gain of 81.6 per cent over the comparable period of 1940. The November index was reported as 241, as compared with 261 in October.

Combination Move Seen In Tin Plate Question

Pittsburgh

• • • Although additional discussions were under way this week concerning the allocation and rating of tin plate tonnage which so far has had no official class A priority rating, recent reports pointed toward a possibility of a definite combination of allocation and granting of an A-1-a rating on tin plate requirements specifically needed for defense and war purposes. It has been reported that all hermetically sealed cans containing food might come under allocation and preference ratings which leads some observers to look for no preference ratings on containers unless they are used for packing food. A concrete definition of what constitutes food is expected to be made soon.

Whatever the final outcome of meetings being held this week, it is now certain that tin plate production and use are to be strictly controlled and will join the list of other steel products over which more or less stringent control has been exercised.

Tools for New Shell Plants

Chicago

• • • Where the bomber program has made little dent in the machine tool market in this section, producers of shells, guns, tanks and a wide variety of artillery components are buying new equipment steadily. Four large companies here are now closing contracts for special shell turning equipment. One of these, International Harvester, is adding to shell orders of fairly long standing. The others are preparing for production on new shell contracts. Fairbanks-Morse and Miehle Printing Press are also buying additional equipment. Heads of the district Army Ordnance office have made it clear that a great number of new companies will be brought into war production here and there is now no question but that the farm implement industry will get a sharp step-up in armament contracts. Surprisingly there has been no noticeable increase in used machinery sales since the formal outbreak of war.

Big Smoke Raised To Hide Gary Works

Gary, Ind.

• • • Acting on instructions from the Army Air Corps and Chemical Warfare Department, the Gary steel works of Carnegie-Illinois Steel Corp. experimentally produced the first smoke screen last week in the midwest. This was on Dec. 18, and a second one was staged on Dec. 22, under supervision of Army officials.

By producing a heavy, black smoke, the Gary works was able to effectively screen the plant from aerial observation. The smoke screen can be quickly and effectively raised on the sounding of air raid alarms. Experiments conducted here will set the pattern for all plants of the United States Steel Corp. and possibly for industry in the midwest.

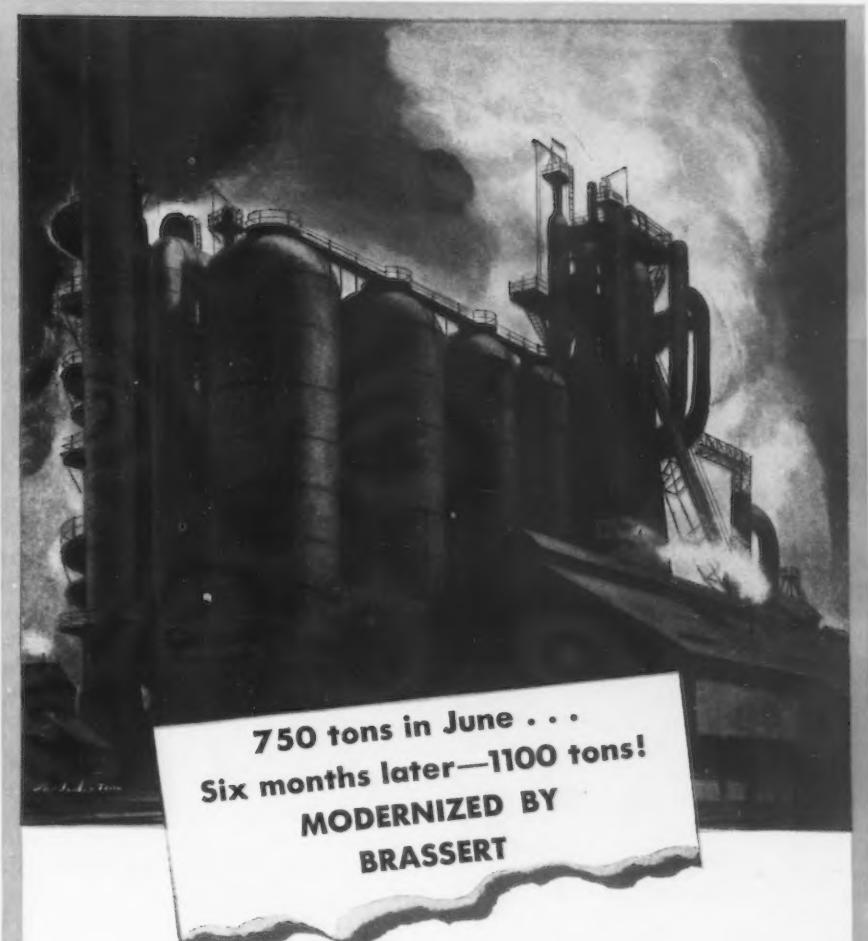
Bankruptcy Law Upheld Over OPA Maximum Schedule

Cleveland

• • • The OPA's attempt to control prices at auctions was given a setback by the decision of William B. Woods, bankruptcy referee, in a ruling in the Bender Body Co. case. He held that the Federal bankruptcy law, being an act of Congress, takes precedence over orders issued by an administrative body, upholding the recent sale of machine tools by the Bender Body Co. at prices above the OPA ceiling. Woods contended that OPM's remedy to do away with the normal costs of bankruptcy sales "could be easily attained by an act of Congress suspending the Bankruptcy Act rules as to auction sales during national emergency."

Overtime Pay in Defense Bonds Approved

• • • Deductions made for the purchase of defense stamps or bonds, when authorized by the employee, are recognized as legal deductions under the Fair Labor Standards Act, Acting Administrator Baird Snyder of the Wage and Hour Division, U. S. Department of Labor, has announced. Overtime pay may be put into defense bonds and stamps.



What is the capacity of America's Iron and Steel Industry?

Through resourcefulness and skill, steel mill engineers and operating men are constantly adding tonnage to America's iron and steel producing capacity. Improved operating practice and modernization of equipment have so increased the efficiency of their plants that new records are made almost daily. Thus the industry takes the lead in answering Uncle Sam's call for full mobilization of our national resources.

In accomplishing these splendid results, iron and steel producers from coast to coast have called upon Brassert engineers for consulting, design and construction service. The data and experience gained through many years of intimate contact with the toughest problems of the industry are available to you in modernizing any phase of your iron and steel production.

H.A. **BRASSET** & CO.

Engineers and Contractors

FIRST NATIONAL BANK BUILDING, PITTSBURGH, PA.
60 EAST 42nd STREET, NEW YORK CITY



ALUMINUM IN DEFENSE: The variety of uses of aluminum in national defense is emphasized by these photos. Gun turrets, shell powder containers, mess kits, airplane gas tanks, airplane rivets, and shell forgings are among the products made at the New Kensington plant of the Aluminum Co. of America.

82—THE IRON AGE, December 25, 1941

Scrap Dealers Postpone Convention in View of War

• • • The board of directors of the Institute of Scrap Iron & Steel has voted to postpone its annual convention for about 60 days due to the war situation. Originally scheduled for Jan. 6, 7, and 8, a new date probably early in March will be set by the board at its meeting to be held shortly after the new year. In the meantime, Institute members will intensify their efforts to get out an even greater supply of scrap.

Dealers are now calling on industrial plants throughout the nation that have iron and steel scrap but do not fabricate steel. The plants are urged to sell all their scrap items such as obsolete machinery, shafting, pulleys, parts, boiler tubes and anything made of iron and steel that is no longer usable.

Reports on results of these suggested visits will be made and transmitted to government agencies. It is believed almost a million tons of scrap is now dormant in industrial plants.

Lectures on Welding to Be Given at Brooklyn by AWS

New York

• • • The sixth annual series of lectures on modern welding practice is to be presented by the New York section of the American Welding Society, beginning Jan. 6. As in previous years, the lectures will be at the Polytechnic Institute of Brooklyn and will be given on successive Tuesday nights, except the second Tuesdays of the month.

This year, 10 authors who have contributed to the revised edition of the Welding Handbook, now on the press, will conduct the series. Subjects covered in the order of presentation are: Weldability of steels, carbon steels and irons, low alloy steels, chromium irons and steels, austenitic steels, clad and coated steels, copper and copper alloys, aluminum and aluminum alloys, nickel and nickel alloys, and lastly, cast steel. A fee of \$4 will be charged non-members.

Men Pledge Output "Doubled and Trebled"

• • • Employees of Ohmer Fare Register Co., Dayton, Ohio, have pledged themselves toward achieving "doubled and trebled production; betterment of the work turned out; strictest economy in materials; promotion of team work and loyalty, and alertness against potential sabotage," in recognition of the war emergency.

The resolution, adopted at a mass meeting, Dec. 11, asserted the employees are equal to the exertions necessary to reach their goal. Large posters in red, white and blue have been printed containing the resolution.

Scrap Industry Salvaging Tin Cans from Army Camps

Washington

• • • Steel sufficient to manufacture 80 small tanks each month, and other ordnance in proportion, is being produced from heretofore unusable scrap made available to steel mills by members of the Institute of Scrap Iron & Steel Inc., in cooperation with the War Department.

Approximately 1600 tons of scrap are coming from the monthly accumulation of food and beverage containers at army camps. Edwin C. Barringer, executive secretary of the Institute, said: "Although tin cans are a distinctly inferior grade of scrap, and can be utilized only in the manufacture of steel where specifications are not too exacting, nevertheless after being burned to remove tin, solder, and foreign material, some mills can melt limited quantities of cans which have been compressed into bundles."

Acme Steel Co. Bonus Will Total \$225,000

Chicago

• • • Acme Steel Co. will distribute \$225,000 in Christmas checks to its employees. Equivalent of two weeks' pay will be given those who have been employed more than six months, while one week's pay will go to those who were employed after July 2, 1941.

Ordnance Offices Get New Speedup Powers

Chicago

• • • Time required for actual closing of Army ordnance contracts amounting to \$1,000,000 or less will be cut in half since district ordnance offices have received permission to complete such contracts on their own without reference to higher authority. Formerly district offices could approve contracts of only \$50,000 or less. The only exception to the new rule is in cases where advance payments to contractors are made.

At a press conference here, Col. Donald Armstrong, chief executive officer of the ordnance district, stated that this area would soon reach the billion dollar mark in contracts placed. It is around the \$600,000,000 post now, with placing of new contracts greatly accelerated.

The first full week of war saw 260 cars of ordnance materiel shipped out of the area, composed mostly of ammunition and guns, he said. The freight bill alone was \$97,000. Indicative of the patriotism of industry is the fact that the first week of war saw 650 more inquiries made at the ordnance office than in any previous week. In the second week, the increase was even greater, over 500 visitors being handled each day. The district office here will be increased from its present 60,000 sq. ft. to over 100,000 sq. ft.

Col. Armstrong warned that the national call for longer working hours did not mean that all armament plants should go on the 24 hr. day, seven-day week without first consulting the district ordnance office.

It was also pointed out that the imminent scarcity of brass for cartridge cases, which resulted in experiments on steel cases, is not yet solved.

Company Issues Bulletins On Priorities and Prices

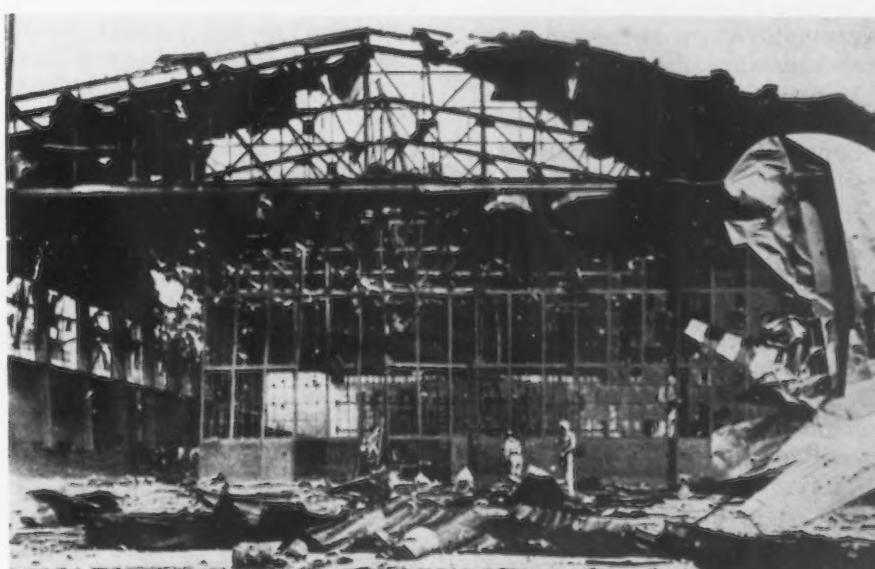
• • • Titan Metal Mfg. Co., Bellefonte, Pa., is issuing bulletins containing regulations and procedures as laid down by the OPM relating in particular to the brass industry. They are punched to fit general catalogs. Bulletins No. 1 and 4 were the first issued.



ANOTHER NAVY TARGET: This is the Japanese battleship Nagato, a 32,700-ton ship carrying eight 16-in. guns. So far, the U. S. Navy has been unable to contact the Japanese navy. One Japanese battleship was sunk by a U. S. bomber.



ONE-MAN TANKS: These Jap soldiers are gathered around a one-man tank used in their war on China. The Japanese, who have used midget submarines in attacking Hawaii, were reported employing these "mighty mites" in the Malay Peninsula fighting.



BEETLE RAID: This the back end of Hangar 11 at Hickman Field after Japanese bombers bombed it during the "sneak" raid on the Hawaiian Island of Oahu on Dec. 7.

OPM Moves Toward Conserving Materials

Washington

• • • **OPM's Priorities** Division made two moves simultaneously last Friday to conserve critical scarce materials, one by an amendment to General Preference Order M-21-a which restricts the use of alloy iron or steel and the other by requisitioning 6500 tons of steel, 3,500,000 lb. of electrolytic copper and 34,000 lb. of tin along with teakwood which were on order for shipment to European countries.

The amendment to conserve alloying elements used in the production of alloy iron and steel prohibits producers from melting any alloy iron or steel containing specified alloying elements in specified amounts, except to fill orders with a rating of A-10 or higher or by special direction of the Director of Priorities.

Effective Jan. 1 is a prohibition of delivery of such materials save on the same terms, with an added proviso that the Director of Priorities may issue orders directing or forbidding specific deliveries. Under the terms of the amendment, the Priorities Director may also issue orders governing the amount of any alloying material to be used in the production of any alloy steel or alloy iron.

Alloy iron or alloy steel containing any one or more of the following elements in the following amounts are covered by the restrictions:

- Manganese in excess of 1.65 per cent
- Copper in excess of 0.60 per cent
- Chromium in excess of 0.60 per cent
- Molybdenum in excess of 0.60 per cent
- Nickel in excess of 0.60 per cent
- Cobalt, tungsten or vanadium in any amount specified or known to have been added to obtain a desired alloying effect.

The seizures of European-bound supplies were the first moves under the requisitioning authority extended to the OPM in the Executive Order signed by the President on Nov. 19. The steel seized

consisted of bars, plates and shapes. The stocks of steel requisitioned were located by OPM's Bureau of Research and Statistics as a result of its survey of "immobilized" inventories. All of the material seized was taken over by the Navy Department which had reported directly on the copper, tin and teakwood supplies.

As pointed out here last week, the stock seizure activities of the newly formed Inventory and Requisitioning Section of OPM will probably become an important factor over the next few months, especially for plants without defense work.

While the past week's seizure was concerned only with idle stocks where shipment to the owner was not possible, the next step will probably be to take over excessive stocks of strategic materials in civilian plants.

The owners of the materials seized last week, mostly firms in Holland, Switzerland and Sweden, which had placed orders before the outbreak of war, will be compensated according to SPAB regulations promulgated on Dec. 8.



PD-3 Use Simplified

• • • Under simplified regulations adopted last week by OPM's Priorities Division, a manufacturer who wants to extend an Army or Navy preference rating certificate PD-3 to obtain material valued at less than \$500 may attend to the extension himself without the necessity of having an Army or Navy contracting officer go through the routine requirements.

This new "streamlining" privilege, however, may be used only if the material is to be physically incorporated in the finished product covered by the certificate being extended.

In extension of ratings in transactions over \$500, the system remained unchanged. Under it a manufacturer must go to the appropriate contracting officer and have him fill out and authenticate a PD-3 form in order to extend his rating to a supplier.

Under the new system applying to orders of less than \$500, the manufacturer involved will certify on his purchase order the rating applicable, the name of the

issuing bureau, the number of the prime contract, the serial number of the certificate being extended and will type on the purchase order the wording of Paragraph No. 3 of the PD-3 form, which reads as follows:

"I hereby certify (a) that the material specified in this certificate is essential for completion of the contract(s) cited herein, (b) that the specified quantities are not greater than required for said contract(s), and (c) that the specified Delivery Date(s) in the installment Delivery Schedule on the face of this Certificate (or appended hereto) are not earlier than actually necessary for completion on time of said contract(s)."

This endorsement on the purchase order must be signed by the manufacturer but need not be countersigned by a Government official where the amount is less than \$500 and the material is to be physically incorporated, as above described.

Copies of purchase orders so certified must be distributed by the manufacturer as follows: one to the supplier of the material in question; one to the supply area or bureau of the Army or Navy initiating the prime contract; and one to the Director of Priorities in Washington.



Reproducing Forms

• • • The OPM Division of Priorities has issued an additional statement relating to the reproduction of "P"—blanket preference rating—orders. (See THE IRON AGE, Dec. 18, p. 100.) It was pointed out that the general instructions permitting qualified persons to reproduce "P" orders, by photo-offset or similar photographic process, do not take precedence over any specific instructions or regulations which have been issued in connection with any specific order.

In the case of P-7, for example, issued to shipbuilders, specific instructions state that copies of the order must not be reproduced by shipbuilders, rated subcontractors of suppliers, but that all copies to be used must be obtained from the Chief of priorities administration branch of the United

States Maritime Commission, Social Security Building, Washington.

Similar instructions have been given in connection with P-14-a and P-14-b, issued to shipyards.

Whenever such specific instructions have been issued, it was explained, they are to be followed. When this has not been done, however, the general instructions reported here last week (page 100) should be followed.



Set Coke Prices at \$6

• • • Pennsylvania coke producers were asked in telegrams last week by Price Administrator Leon Henderson not to sell blast furnace beehive coke in excess of \$6, ovens, to the ultimate consumers, effective Dec. 15. By fixing the price on this basis it includes all costs, such as commissions, OPA said.

In announcing this action, it was said to be taken to forestall an indicated 25c. increase in price of beehive coke in Pennsylvania, where about 85 per cent of the nation's production originates.

The telegrams were sent to 55 producers responsible for virtually all of the Pennsylvania output. Production was said to be running at somewhat more than 600,000 tons monthly, of which considerably more than 500,000 tons originates in Pennsylvania.



Will Fix Bolt, Nut Prices

• • • OPA is gathering data from industry preliminary to the preparation of a schedule of ceiling prices for bolts, nuts and rivets. OPA is expected to issue the prices soon. Bolts, nuts and rivets were not included in the steel mill price schedule or in the warehouse schedule.



Vanadium to Be Allocated

• • • Issuing General Preference Order M-23-a, replacing M-23, OPM's Division of Priorities last Saturday placed vanadium under a complete allocation system, due, it was said, to increased demand for alloy steel for military uses, coupled with a limited supply. The new order provides for monthly requests for vanadium allotments and

OPA Warns On Incorrect Use Of Extras

Washington

• • • Several violations which had been called to his attention prompted Price Administrator Leon Henderson last week to address a letter to the steel industry that to have been "in effect" on April 16, 1941, an "extra" must have been customarily charged on that date or during the two or three preceding years and, also must have been listed and filed with OPA. It was added that an "extra" is not considered to have been "in effect" even if listed and filed, if it were not customarily charged.

authorizes the Director of Priorities to make monthly allocations without regard to previous preference ratings. Consumers receiving less than 50 lb. per month need not file reports.



Diesel Prices Stabilized

• • • Informal arrangements whereby diesel engine prices will not be increased above the levels of Oct. 1 will be continued for the present, OPA has announced.



• • • In order to facilitate the increased production of acetone, butanol and ethyl alcohol from corn, a high-cost raw material, OPA has acted to increase its ceiling prices for these three basic industrial chemicals. The new maximum price levels, contained in temporary amendments to each schedule are effective Jan. 1, 1942.



• • • With domestic metal production of more vital importance than ever before, the Priorities Division of OPM has issued a preference rating order designed to assure that the complete cycle, from mining through refining, be completed without interruption. Of the four steps essential to metal production—mining, concentration, smelting and refining—the first two are covered by preference rating order P-56, which extends priority assis-

tance to mine operators in the acquisition of necessary maintenance, repair and operating supplies. The order issued today, preference rating order P-73, provides similar aid to accredited smelters and refiners of copper, lead, zinc, antimony, mercury and cobalt.

Primary producers engaged in these operations must obtain a serial number from the priorities division before the benefit of the order may be applied to deliveries. Form PD212, marked "Ref: P-73," should be filled out by the applicant, and forwarded to the Priorities Division.

Under the terms of the new order a basic rating of A-3 is provided for essential repair, maintenance and operating supplies. Producers will be given an emergency rating of A-1-a for actual breakdown or suspension, and an intermediate rating of A-1-c for necessary advance provision to avert breakdown or suspension. These two latter ratings are available only after advance approval by the Director of Priorities.



Warehouse Quota Fixed

• • • Steel warehouses and other resale sources will be given a quota of slightly more than 9,000,000 tons a year, a total representing a gain of about 40 per cent over the tonnage distributed by such sources in 1940, but slightly below the volume handled in 1941, J. R. Stuart, chief of the warehouse section of OPM, told a meeting of warehousemen and distributors in New York last Friday. The meeting, sponsored by the Steel Distributors Institute, was attended by about 1000 persons.

The amount of steel obtained by a warehouse, Mr. Stuart said, will depend upon the amount of war work it handles. It was also pointed out that the quota established for warehouses was predicated upon a steel ingot output of 84,000,000 tons for 1942. Should production fall below this level, the quota might have to be correspondingly reduced.

Mr. Stuart disclosed that an amendment to Order M-21-b to be issued shortly will correct certain

THIS WEEK'S

Prices and Priorities

Cast iron soil pipe, vitrified clay sewer pipe and domestic oil burner storage tank makers discussed price stabilization of these construction materials with OPA last week. (OPA:T-101)

Alloy steels containing manganese, copper, chromium, molybdenum, nickel, cobalt, tungsten and vanadium may be shipped only for defense use after Jan. 1, according to amendment No. 2 to Order M-21-a, issued Dec. 20.

Benzol, tuluol, xylol and solvent naphtha makers requested not to raise first quarter prices more than 1c. per gal. above last quarter, 1941, prices. (OPA:PM1839)

Repair order No. 22 revoked and replaced by Order P-100 issued Dec. 18. New order is more liberal than P-22 and is designed to eliminate some of the conflicting points of the old order. (OPM:PM1828)

Extension of PD-3 on amounts less than \$500 streamlined and simplified in supplement No. 6 to Administrative Order No. 1, issued Dec. 16. (OPM:PM1859)

Field office of Priorities Division opened at Security Bldg., Phoenix, Ariz. (OPM:PM1844)

Second-hand burlap and cotton bag prices placed under a ceiling in price schedule No. 55 issued Dec. 16. (OPA:PM1838)

Nickel scrap dealer forced to make refund of all amounts received in excess of maximums in schedule No. 8. (OPA:PM1836)

Hog and pig bristles more than 3 in. in length placed under full priority control in order M-51 issued Dec. 13. (OPM:PM1851)

Reclaimed rubber placed under a price ceiling in schedule No. 56 issued Dec. 16. (OPA:PM1823)

Tin supplies subjected to full priority control in Order M-43 issued Dec. 17. (OPM:PM1852)

Ferrochromium makers agree to specification changes to permit use of lower grade ore. (OPM:PM1842)

Carbon black producers permitted to raise prices by slightly less than 5 per cent due to cost increases. (OPM:PM1848)

U. S. Rubber Co. plant in Los Angeles making bullet proof oil and gas tanks granted rating of A-1-d for certain construction material. (OPM:PM1857)

Sulphuric acid makers agree to keep first quarter prices at level, prevailing now. (OPA:PM1853)

Guayule rubber sellers requested not to raise prices above Dec. 6 levels. (OPA:PM1835)

Converted paper product makers asked not to raise prices above current levels. (OPA:PM1819)

Vanadium distribution placed under a full allocation system in order M-23-a issued Dec. 20. (OPM:PM1855)

Diesel engine price stabilization to be continued by voluntary agreement.

Acetone, butanol and ethyl alcohol maximum prices to be increased, OPA announces, due to high production costs. (OPA:PM1898)

Chlorine production to be placed under direct allocation after Feb. 1, 1942, according to amendment to order M-19.

Smelters and refiners of copper, lead, zinc, antimony, mercury and cobalt assigned high priority ratings for maintenance, repair and operating supplies under terms of order P-73.

Suspension order No. 2 issued by OPM removes priority assistance from two companies accused of various priority violations. (OPM:PM1881)

Manila cordage sale subjected to further restrictions by amendment to order M-36 issued Dec. 19. (OPM:PM1887)

Tin sale ban extended to Jan. 5, 1942. Other minor changes in freezing order announced. (OPM:PM1910)

For copies of above announcements address defense agency concerned, at Washington, giving announcement number as shown in parentheses after each paragraph. (For example, OPM:PM1500 means announcement 1500 issued by Office of Productive Management).

Revisions For The Iron Age Priorities Guide

• • • Following revisions are to be made to THE IRON AGE Allocations and Priorities Guide published Nov. 27.

Under "P Orders," page 5, add:

P-22—Revoked by Order P-100, Dec. 18, 1941.

P-100—Repairs, maintenance and operating supplies (12-18). Revokes Order P-22.

P-73—Maintenance, repair and operating supplies for smelters, refiners of copper, lead, zinc, antimony, mercury or cobalt. (12-22)

Under "M Orders," page 5, add:

M-21-a—Amendment No. 2 (12-20). Extends control to alloy steels and iron containing specified quantities of manganese, silicon, copper, aluminum, boron, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, or other materials added to obtain "a desired alloying effect."

M-19—Amendment No. 1. Full allocation system established for chlorine. (L2 12-20)

M-23—Full allocation established for vanadium (12-20)

M-43—Tin, domestic and imported. (12-17). Lots of less than 5 tons not affected by control, other than Priorities Regulation No. 1.

M-51—Hog bristles more than 3-in. long. (12-13)

Under "OPA Price Schedules," page 5, add:

No. 55—Second hand burlap and cotton bags (1216)

No. 56—Reclaimed rubber (12-16)

"weaknesses" in the original warehouse order. In addition it will separate certain large products on which quotas can be established from some of the small merchant products, which are sold in such small tonnages that quotas cannot be established.

OPM also promised that everything possible would be done to streamline the order and to eliminate as much paperwork as possible. Mr. Stuart also said that although the demand for plates for direct war work was especially heavy, he believed that some would be made available for distribution through resale channels.

NEWS OF INDUSTRY

Repairs, Maintenance Order Is Designed to Assist Many Plants

Washington

• • • A new order, designed to help many thousands of manufacturers and producing plants to obtain repair, maintenance and operating supplies has been announced by OPM. The new order is known as preference rating order P-100. It takes the place of the old repair and maintenance order, P-22, which is being revoked.

The differences between P-100 and P-22 are largely technical. However, some provisions of the old plan have been liberalized.

The assistance granted by the order is not available for retail operations.

The former restriction on acceptance of materials for inventory of maintenance, repair or operating supplies by producers using the order has been changed to permit inventory and stores not exceeding 110 per cent of the maximum dollar volume of such materials purchasing during the corresponding calendar quarter of 1940. The previous figure was 100 per cent in P-22.

This change has been made to allow for price increases. However, the Order now specifically states that no materials may be accepted for additions to inventories and stores of maintenance, repair and operating supplies until such inventories have been reduced to a practicable working minimum.

The restriction on withdrawals from inventory or stores has also been changed to permit withdrawals up to 110 per cent of the aggregate dollar volume of such withdrawals in the corresponding quarter of 1940, or, at the producer's option, up to 27½ per cent of the aggregate dollar volume of withdrawals during the calendar year 1940.

Producers whose aggregate purchases of materials for maintenance, repairs and operating supplies do not exceed \$5,000 in a calendar quarter, and whose withdrawals of such from inventory or stores likewise do not exceed \$5,000, are exempt from the restrictions as to purchasers and withdrawals. Under P-22 amended (the former order), the exemption was limited

to producers whose purchases and withdrawals did not exceed \$2,500 in a calendar quarter.

Allowances for inventory use will be made for manufacturers operating on an overtime basis as it is realized that overtime or extra shifts consume an abnormal amount of operating consumable supplies and that an extra allowance is necessary for maintenance and repair due to machine fatigue.

It is not permitted to purchase materials under the order for expansion or betterment of property or equipment. The user in such a case should file form PD-1 when it is necessary to increase the operating capacity of his business. The producer should also use a PD-1 to obtain items that are capitalized and carried on his books as a fixed asset.

Operating supplies have also been re-defined in the new order to include ferrous parts required to manufacture containers. This change will assist producers in obtaining nails, barrel hoops and other ferrous items necessary in the operation of their business.

A new provision forbids the application of the A-10 rating under P-100 where any other order of the Division of Priorities assigns some other rating to specific uses of a particular material. The purpose of this change is to prevent draining off of a number of materials, chiefly chemicals, for which "ladders of use" have been established by already existing E or M orders. The preference rating assigned by P-100 may not be used to obtain deliveries of any material to be used for purposes prohibited by any order or regulation issued by the Director of Priorities.

Producers and suppliers purchasing metal cutting tools as defined in order E-2-a must use the metal cutting tool certificate of inventory control, stating that the tools on the order will not increase stocks beyond a three-month period.

Special attention is called to provisions of the order (in B-3) which grant priority aid to: welding repair shops, blacksmith repair shops, small machine repair shops, and other persons whose business is primarily a repair function to use this order to keep in working order their own establishments. It also permits such persons to procure the necessary tools and other items consumed in the course of their repair business.

This also applies to the acquisition of mechanics' hand and fine mechanical measuring tools when purchased by a mechanic for use in his capacity as an employee of a plant engaged in defense work.

Stocks of Superior Ore

Total 45,534,633 Tons

Cleveland

• • • Consumption of Lake Superior iron ore during November fell slightly from 6,612,186 tons in October to 6,501,027 gross tons, according to the Lake Superior Iron Ore Association. This was due largely to the fact that November was a shorter month. In any event, up to Dec. 1, 1941, 69,273,701 gross tons of iron ore had been consumed by American and Canadian furnaces and of this tonnage 67,707,421 tons were consumed in the United States and 1,566,280 tons in Canada.

Total stocks on Lake Erie docks and at furnaces in the United States and Canada amounted to 45,534,633 gross tons as compared with the year earlier figure of 41,711,704 tons.

Machine Tool Builders to Raise Output 50-100%

Washington

• • • At the Dec. 17-18 OPM meeting with machine tool makers for the airplane, anti-aircraft, and machine gun industries, mobilization of these groups on a war time basis was sped by a pledge to increase production from 50 to 100 per cent. Based on 1941 shipments, this would call for 1942 shipments between \$1,150,000,000 and \$1,530,000,000. Two groups of approximately 20 machine tool makers attended the meetings. New productive equipment needs, increased costs, finance, prices, and labor problems also were discussed.

Stacks Are Hot, Santa Finds

Pittsburgh

• • • Practically all steel companies in this district continued operations of coke ovens, blast furnaces and some primary steel making facilities, through Christmas and paid time and a half to all workers employed on that day.

OPA Resale Steel Price Ceiling Order, Condensed

Price Schedule Has Wide Application

• • • Price schedule No. 49, covering the resale of iron or steel products, has wide application. The OPM estimated it applies to 25,000 firms engaged in selling iron and steel.

A condensed version of the order is printed below. This covers most of the principal points of the price order, but some sections are abbreviated and several are omitted entirely. Consult a copy of the order in full if questions arise.

This price order was issued Dec. 13. Unfilled contracts at prices higher than the April 16 maximums cannot be filled without official permission.

§1306.151 Maximum Prices for the resale of iron or steel products.

On and after December 15, 1941, regardless of the terms of any contract of sale or purchase, or other commitment, except as provided in Section 1306.154 hereof, no seller as defined in Section 1306.157 (b) of this Schedule shall sell, offer to sell, deliver or transfer iron or steel products, and no person shall buy, offer to buy, or accept delivery of iron or steel products at prices higher than the maximum prices set forth in Appendix A.

§1306.152 Less than maximum prices may be charged, demanded, paid or offered.

§1306.153 Evasion. Price limitations shall not be evaded either by direct or indirect methods.

§1306.154 Records and reports. Complete and accurate records of (1) each purchase or sale must be kept for at least one year, and (2) the tonnage of iron or steel products, on hand and on order, classified by product, in a manner similar to that of Form PD 83 as issued by the OPM.

Filing prices. On or before December 31, 1941, every seller of iron or steel products having annual gross sales of \$50,000 or more during the year ending Dec. 31, 1941, shall file in duplicate with the Office of Price Administration, Washington, his prices circulated to his salesmen or customers in effect on April 16, 1941, or customarily quoted and charged on that date, including extras lists, deduction lists, charges, and discounts. Every seller shall file individual price sheets for each warehouse or branch, showing city and country prices, wherever such exist.

§1306.157 Definitions. "Seller" means any person who resells iron and steel products to any other person, whether as distributor, jobber, dealer, agent, broker, merchant, ex-

porter, including any person who acts as an intermediary in any connection with such resale, or otherwise: Provided, That:

(i) The term shall not include producers of iron or steel products whose activities are covered by Price Schedule No. 6—Iron and Steel Products, except insofar as such producers operate warehouses, branches, or affiliates engaged in the redistribution of iron or steel products. The operation by producers of mill depots for the purpose of distributing iron or steel products manufactured by such producers shall not be considered a resale within the terms of this Schedule, but is a sale covered by Price Schedule No. 6.

(ii) "Seller" shall not include retail merchants who sell iron or steel products in quantities smaller than those dealt in or on which prices are quoted by established jobbers, dealers, or distributors.

"Iron or steel product" includes all iron or steel ingots, all semi-finished iron or steel products, all finished hot rolled or cold rolled iron or steel products, and all iron or steel products further finished (by galvanizing, enameling, plating, coating, drawing, extruding, or otherwise). The terms shall not include pig iron. Any iron and steel products as defined above subject to the operations of pickling, cutting by machine or flame, bending and threading of pipe, shall be considered a part of this definition of iron or steel products. This definition includes primes, seconds, wasters and all other off-grade products including used products.

"Maximum delivered price" means the combination of all factors entering into the final charge to the customer.

"Published listed price" or "published list price" means a price for resale of iron or steel products publicly circulated in the trade, and is confined to price lists issued for the cities named and the persons stated in Appendix B, incorporated herein as Section 1306.160. If not otherwise stated, the term is meant to apply only to price lists effective as of April 16, 1941. In any "Listed City" in which there are several such published listed prices for any product or quantity, the highest of such prices shall be the published listed price herein referred to;

(f) "dislocated tonnage" means any shipment to which the terms of Section 1306.159 (f) of this Schedule are applicable;

(g) "governing basing point" means the basing point of producers of iron or steel products included in Price Schedule No. 6, which results in the lowest delivered price to the mill customer;

(h) "mill base price" means the price at the basing point which governs a sale from a mill by producers of iron or steel products included in Price Schedule No. 6;

(i) "Listed City" means any city named in Appendix B;

(j) "Unlisted City" means any city or place other than those in Appendix B;

(k) "lowest combination" means the lowest delivered price that is the result of a combination of (1) country price of any seller located in any Listed City and (2) less-than-carload freight from such Listed City;

(l) "freight as customarily charged" means that type of freight, either all-rail, rail and water, or all water which is customarily used and which may be used to arrive most economically at the place of delivery;

(m) "mixed carload" means a bona fide mixed carload, containing several items of different kind, size, gage, and quality, out to be less than, without limiting the generality of the foregoing, five different items of substantial size.

§1306.159 Appendix A.—Domestic and Export Maximum Prices For Iron and Steel Products.

(a) Maximum Delivered Prices in a City or Free Delivery Area in Which the Seller is Located.

(1) In any city or free delivery area in which the seller is located, the maximum delivered price for any iron or steel products shall be the delivered price which was or would have been charged by the seller on April 16, 1941. It is provided however:

(i) That in cities designated in Appendix B as Listed Cities, the maximum delivered price shall not exceed the published list prices, as set out in Appendix B, in effect as of April 16, 1941, for that city or free delivery area.

(ii) That in Unlisted Cities, the maximum delivered price shall not exceed the lowest delivered price that is the result of a combination of (a) country prices of any seller located in any Listed City, and (b) less-than-carload freight from such Listed City.

(2) (i) Extras which were customarily charged as of April 16, 1941, may be computed in the maximum delivered price. Extras listed but not customarily charged as of April 16, 1941, shall not be charged.

(ii) Deductions customarily granted as of April 16, 1941, shall be deducted in computing the maximum delivered price.

(3) Persons not having prices shall compute maximum delivered prices in accordance with paragraph (c) of this section.

(b) Maximum Delivered Prices in Places Other Than the City or Free Delivery Area in Which the Seller is Located.

(1) In any place other than a city or free delivery area in which the seller is located, the maximum delivered price for that seller shall be

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the lowest delivered price that is the result of a combination of (i) country price of any seller located in any Listed City and (ii) less-than-carload freight from such Listed City. It is provided, however, that in no case shall the maximum delivered price on a sale for delivery into a Listed City exceed published listed prices, as set out in Appendix B, in effect as of April 16, 1941, for that city or free delivery area.

(c) Maximum Delivered Prices for Persons Without Prices.

(1) In the city or free delivery area in which such persons are located, the maximum delivered price for persons having no prices for the product or the quantity being sold shall be:

(i) In Listed Cities, the maximum delivered price shall not exceed the published listed prices, as set out in Appendix B, for that city or free delivery area.

(ii) In Unlisted Cities, the maximum delivered price shall not exceed the lowest delivered price that is the result of a combination of (a) country prices of any seller located in any Listed City, and (b) less-than-carload freight from such Listed City.

(2) If a person not having prices sells for delivery into a place other than the city or free delivery area in which he is located, the maximum delivered price shall be set in conformance with paragraph (b) of this section.

(3) Any person who for any reason is unable to set a maximum delivered price in accordance with the terms of this Schedule may apply to the Office of Price Administration to set maximum delivered prices for the sale or series of sales in question.

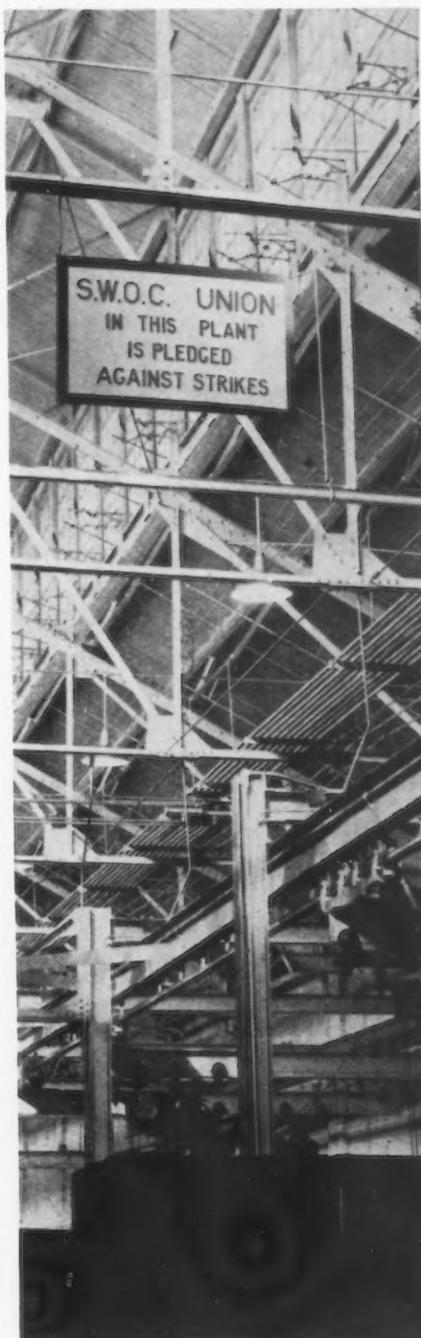
(d) Modification of certain April 16, 1941, prices.

(1) Any seller located in a Listed City or free delivery area to which published listed prices are applicable, if his prices as of April 16, 1941, were lower than such published listed prices, may make application to the Office of Price Administration to increase the maximum delivered price applicable to him in order to correspond to the published listed prices applicable to such Listed City or free delivery area.

(2) The Office of Price Administration may at its discretion list additional cities as Listed Cities, and will receive applications by sellers located in Unlisted Cities requesting that such Unlisted Cities be made Listed Cities.

(e) Maximum Prices for Exports of Iron or Steel Products.

The maximum prices which may be charged shall be the domestic prices, as established in paragraphs (a), (b), (c), and (j) of this Schedule, f.a.s. the port from which export is to be made: Provided, That on shipments for export of less-than-carload quantities, a mark-up of \$3.00 per net ton may be added if sold by an export broker. Extras which were customarily charged as of April 16, 1941, may be computed in the maximum delivered price. Extras listed but not customarily charged as of April 16, 1941, shall not be



ALL-OUT FOR DEFENSE: Shortly before Japan declared war on the United States, the Steel Workers' Organizing Committee declared an "all-out" campaign for defense in this plant.

charged. In the case of certain products requiring special packing, such extra charges shall be not more than the standard published mill extras. Deductions customarily granted on April 16, 1941, shall be deducted in computing the maximum price under this paragraph.

(f) Maximum Delivered Prices for Dislocated Tonnage.

In case of shipments by a seller of 150 miles or more, and if shipment is through or into any Listed City, or substantially in the same direction

and past any Listed City, or in case of any shipments by a seller of not less than 350 miles, the maximum delivered price for any iron or steel product so shipped may be increased by the excess of (1) the country price of the seller plus less-than-carload freight as customarily charged less 15c. per cwt., above (2) the maximum delivered price for the place of delivery, as computed in paragraph (b) of this section.

(g) Maximum Delivered Prices on the Pacific Coast and for Gulf Ports; Special Filing Provisions.

(1) Maximum delivered prices on the Pacific Coast shall be as provided in paragraphs (a), (b), (c), and (j) of this section: Provided, That:

(i) On the following products and no others, the sum of 35c. per cwt. may be added to the maximum delivered price as established in paragraphs (a), (b), (c), and (j) of this section: plates, universal and sheared, carbon; hot rolled sheets, carbon; hot rolled bars and small shapes, carbon; galvanized, galvannealed, enameled, and galvanized corrugated sheets; floor plates; hot rolled strip, carbon; and structural shapes, carbon.

(ii) Pending analysis of data to be submitted under provisions of this Schedule, on standard pipe, seamless pipe, water well casing, large O.D. pipe, line pipe, wrought iron pipe, oil country tubular goods, and boiler and other pressure tubes in all cases where the rail and water rates to Pacific Coast ports are referred to in Section 1306.159 (i) (1, 2, 3, 4, and 5) below these shall be disregarded and the maximum delivered prices on sales of above products at Pacific Coast points shall be the lowest prices resulting from that combination of base prices in effect April 16, 1941, and published all-rail carload freight from that mill basing point which gives the lowest delivered price to destination of customer plus such mark-up as is allowed for each product as set forth below in (i)

(iii) Pending analysis of data to be submitted under provisions of this Schedule, sellers located in Gulf Ports shall have a maximum delivered price as established in paragraphs (a), (b), (c), and (j) of this section based on sellers' prices in effect as of April 16, 1941.

(2) Information from Pacific Coast and Gulf Port sellers is required to be filed with the Office of Price Administration on Forms 149:1 and 149:2 respectively.

Copies of Forms 149:1 and 149:2 may be had upon request by applying to the Office of Price Administration.

(h) Maximum Delivered Prices for Specific Wire Products.

(1) Notwithstanding the provisions of any other section of this Schedule, the maximum delivered price of less-than-carload quantities of standard wire nails, annealed smooth wire, and galvanized smooth wire, in the city or free delivery area in which the seller is located, shall be the aggregate of:

(i) Mill straight carload price,

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(after deducting the regular jobber allowance of 15c. per cwt.),

(ii) Carload freight from mill Basing Point to warehouse, and

(iii) One of the following: For standard wire nails — 50c. per cwt.; for annealed smooth wire — 60c. per cwt.; for galvanized smooth wire — 68c. per cwt.

(2) The maximum delivered price of less-than-carload quantities of standard wire nails, annealed smooth wire, and galvanized smooth wire at any other place, shall be the lowest delivered price that is the result of a combination of (a) the price (as computed above) of any seller located in any **Listed City** and (b) less-than-carload freight from such **Listed City**.

(3) Extras charged by jobbers and dealers on merchant wire products shall be the same as regular published mill extras in effect as of April 16, 1941. Deductions customarily granted as of April 16, 1941, shall be deducted in computing the maximum delivered price.

(4) The maximum delivered prices for all other merchant wire products shall be computed as provided in paragraphs (a), (b), (c), and (j) of this section.

(i) Maximum Delivered Prices for Pipe and Tubular Products.

Notwithstanding the provision of any other section of this Schedule, the maximum delivered prices for the following types of iron and steel pipe and tubular products shall be as follows. Standard published mill extras which were charged as of April 16, 1941, may be computed in the maximum delivered price provided that where extras were listed but not customarily charged as of April 16, 1941, they shall not be charged. Deductions customarily granted as of April 16, 1941, shall be deducted in computing the maximum delivered price.

(1) For standard pipe, seamless pipe, water well casing, large O.D. pipe, and line pipe: the lowest price resulting from that combination of flat basing card discounts of the National Tube Company in effect April 16, 1941, and published all-rail carload freight from Basing Point to destination of customer (except to Pacific Coast points where the rail and water rate is applicable) plus

(i) 25% on standard pipe, reamed and drifted pipe and line pipe six inches and smaller, both black and galvanized, and

(ii) 30% on all larger sizes of standard pipe and line pipe, also all sizes of extra strong and double extra strong, both black and galvanized, and all sizes of water well casing and large O.D. pipe.

(2) For wrought iron pipe: the price resulting from combination of resale discounts for sales from distributors' stocks as shown on A. M. Byers Company card in effect April 16, 1941, and published all-rail carload freight from Pittsburgh to destination of customer (except to Pacific Coast points where the rail and water rate is applicable).

(3) For oil country tubular goods: the lowest price resulting from that combination of Basing Point prices as published by Oil Well Supply Company, distributor for National Tube Company, in effect on April 16, 1941, (Oil Country Tubular Goods Price List No. 24) and carload freight or transportation charges to destination of customer as computed in National Tube Company Freight Book No. 1.

(4) For boiler and other pressure tubes: The lowest price resulting from that combination of Basing Point prices in each quantity bracket of the National Tube Company Price List for sales to consumer in effect April 16, 1941, and less-than-carload freight from Basing Point to destination of customer (carload freight shall be charged on shipments of 40,000 lbs. and over).

(5) For cold drawn seamless and other mechanical tubing: the prices in effect and actually charged as of April 16, 1941, by the exclusive distributors of the National Tube Company, covering all sections of the company, shall be the maximum prices to be charged in areas served by each such distributor.

(j) Maximum Delivered Prices for Tool Steel.

Notwithstanding the provisions of any other section of this Schedule, the maximum delivered price for Tool Steel shall be the prices listed in the published price list of Crucible Steel Company, effective on April 16, 1941. The locations of warehouses of the Crucible Steel Company are set forth in Appendix B of this Schedule.

(k) Maximum Delivered Prices for Shipments in Carload Quantities, and in Certain Specific Cases.

(1) Prices in excess of the mill prices provided under Price Schedule No. 6 shall not be charged by any person for:

(i) Direct shipments from producers or converters of any quantity of iron or steel products; or

(ii) Shipments of any quantity diverted from delivery to warehouses; or

(iii) Shipments of any quantity not put through the operations commonly known as the warehousing of iron or steel products.

(2) Notwithstanding the provisions of any other section of this Schedule, shipments of mixed carloads of 40,000 lbs. or more out of warehouse stock, which shipments are made up of a variety of iron and steel items (such as plates, shapes, bars, sheets, special or otherwise, strip; carbon, alloy and stainless) of different types, cross-sections, qualities, or classes, shall not be sold at a price in excess of the maximum delivered price for a 500-lb. quantity minus a discount of not less than \$7.00 per net ton.

(3) Mixed carloads of Merchant Wire Products shall be sold at maximum prices not exceeding the published mill base prices established under Price Schedule No. 6. (Regular jobber allowances given by mills may be retained by seller of such mixed carload).

(4) Mixed or straight carloads of 40,000 lbs. or more of pipe and tubular products, including boiler and other pressure tubes and mechanical tubing, shall be sold at maximum delivered prices not to exceed published mill carload prices of such products established by Price Schedule 6; provided that the above provision shall not apply to sales of Oil Country Tubular Goods out of distributor's stocks, but shall apply to direct mill shipment.

(5) Notwithstanding the provisions of any other section of this Schedule, on shipments of 40,000 pounds or more out of seller's stock not falling within paragraph (2) of this section, the maximum delivered price shall be the mill price as established under Price Schedule No. 6. Provided that on presentation to the Office of Price Administration of a certificate that such shipment out of seller's stock has been specifically authorized by the Office of Production Management, a maximum delivered price will be established by the Office of Price Administration.

(6) Notwithstanding the provisions of any other section of this Schedule, in the case of any shipment of any quantity out of a warehouse stock which has been specifically allocated to the warehouse by the Office of Production Management, and has been there held for reshipment at the direction of the Office of Production Management for use in defense repairs or other defense purposes, the maximum delivered price shall be fixed by the Office of Price Administration upon application for the setting of such maximum delivered price, which application shall contain a sworn statement setting forth the source of such iron or steel products, the Office of Production Management rating or certificate, and the destination to which the Office of Production Management has directed that shipment be made.

(7) Records on any sales of 40,000 pounds or more of any iron or steel products to any single customer in any calendar month shall be filed with the Office of Price Administration on or before the 15th day of the next succeeding month.

(l) Maximum delivered prices for seconds, wasters, off-grade and used products.

The maximum delivered price for all off-grade, seconds, wasters and used iron or steel products, after such shearing, cutting, straightening, bending or pickling, as may be necessary, shall not exceed the maximum delivered price for comparable iron or steel products of prime quality.

(m) General provisions.

(1) Delivery and other services of all kinds, credit or other discounts, all freight absorptions (except as otherwise specified in this Schedule), all allowances, and all other privileges in effect on April 16, 1941, shall be continued without diminution or extra charge.

(2) Brokers, agents, consignees, distributors without stocks, and other persons acting in sales transactions

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on behalf of owners of iron or steel products other than producers, may continue to charge their customary commissions in effect on April 16, 1941: Provided, That in such cases where commissions are to be added to the selling price, the result shall not exceed the maximum delivered price as established by this Schedule.

§1306.160 Appendix B—Listed Cities
(a) Listed Cities or Free Delivery Areas in which sellers stock Heavy Steel Line and Merchant Wire Products.

Baltimore: Scully Steel Products

Birmingham: Southern Steel Co.
 Moore-Handley Co.*

Boston: Jos. T. Ryerson & Son
 Scully Steel Products
 Wheeling Corrugating Co.*
 Wheelock-Lovejoy & Co.

Buffalo: Jos. T. Ryerson & Son
 Wheeling Corrugating Co.*
 Wheelock-Lovejoy & Co.

Chicago: Jos. T. Ryerson & Son
 Scully Steel Products
 Jones & Laughlin Steel Corporation
 A. M. Castle & Co.
 Hibbard Spencer Bartlett & Co.*
 Wheelock-Lovejoy & Co.

Cincinnati: Jos. T. Ryerson & Son
 Jones & Laughlin Steel Corporation
 The H. Belmer Co.*
 Wheelock-Lovejoy & Co.

Cleveland: Jos. T. Ryerson & Son
 Scully Steel Products
 The Geo. Worthington Co.*
 Wheelock-Lovejoy & Co.

Detroit: Jos. T. Ryerson & Son
 Jones & Laughlin Steel Corporation
 Buhl Sons Co.*
 Wheelock-Lovejoy & Co.

Houston: Earle M. Jorgensen Co.
 F. W. Heitmann & Co.*

Indianapolis: W. J. Holliday Co.

Los Angeles: A. M. Castle & Co.
 Earle M. Jorgensen Co.
 Ducommun Metals & Supply Co.

Memphis: Jones & Laughlin Steel Corporation

Milwaukee: Jos. T. Ryerson & Son
 Frankfurth Hardware Co.*

New Orleans: Jones & Laughlin Steel Corporation
 Cahn Bros. & Ryder, Inc.*

New York: Jos. T. Ryerson & Son
 Scully Steel Products
 Jones & Laughlin Steel Corporation
 Wheelock-Lovejoy & Co.

Norfolk: Eagleston-Parke, Inc.

Omaha: Drake-Williams-Mount Co.

Philadelphia: Jos. T. Ryerson & Son
 Wheeling Corrugating Co.*

Pittsburgh: Scully Steel Products
 Jones & Laughlin Steel Corporation
 C. A. Turner Co.*

St. Louis: Jos. T. Ryerson & Son
 Scully Steel Products
 Wheelock-Lovejoy & Co.

St. Paul: Scully Steel Products

San Francisco: A. M. Castle & Co.
 Earle M. Jorgensen Co.

Seattle: A. M. Castle & Co.

(b) Listed Cities or Free Delivery Areas in which Crucible Steel Company Warehouse Stocks of Tool Steel are located.

Atlanta: Boston: Buffalo: Chicago: Cincinnati: Cleveland: Denver: Detroit: Indianapolis: Los Angeles: Milwaukee: Newark: New York: Philadelphia: Providence: St. Louis: San Francisco: Seattle: Springfield.

(c) Listed Cities or Free Delivery Areas in which National Tube Company's Exclusive Distributors of Mechanical Tubing are located.

Cambridge: Austin-Hastings Co.
 Los Angeles: Ducommun Metals & Supply Co.
 New York: Peter A. Frasse & Co., Inc.

Buffalo: Peter A. Frasse & Co., Inc.

Philadelphia: Peter A. Frasse & Co., Inc.

Cincinnati: E. K. Morris & Co., Inc.

Chicago: C. A. Roberts Co.

Detroit: C. A. Roberts Co.

Indianapolis: C. A. Roberts Co.

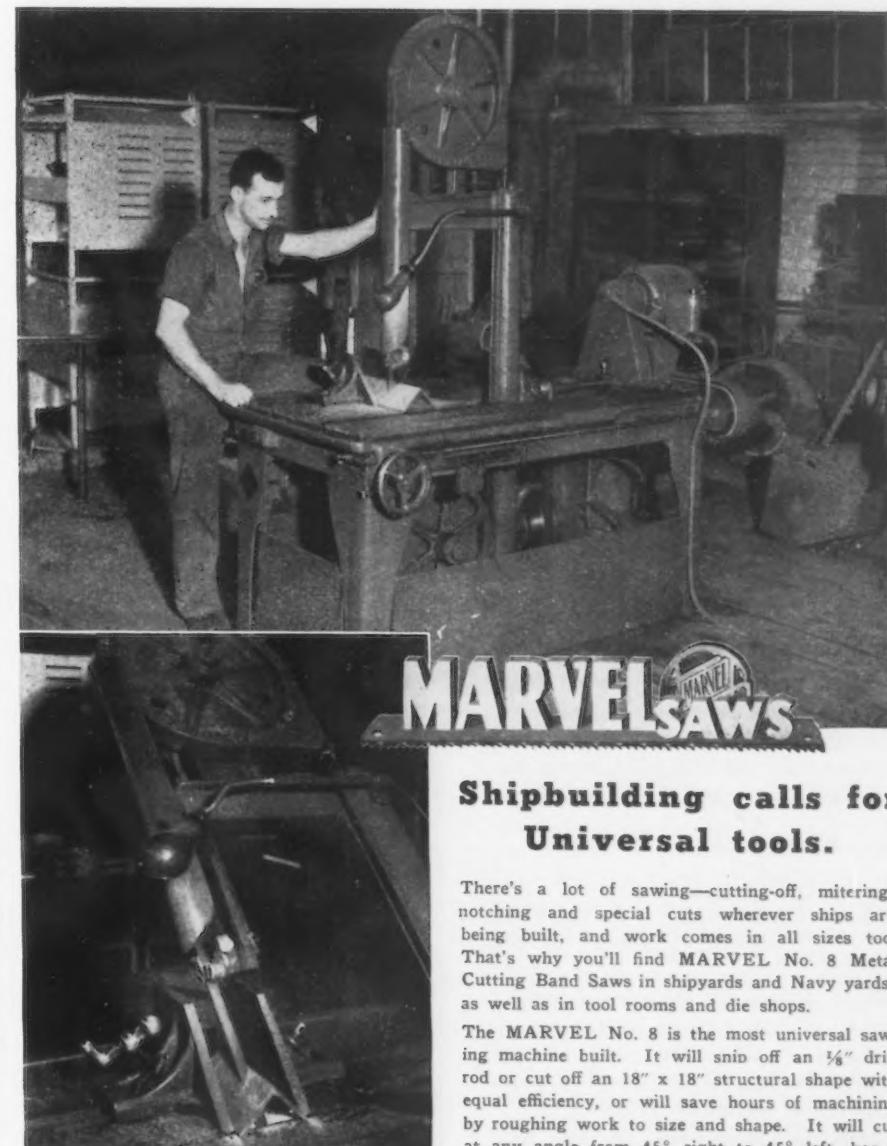
St. Louis: C. A. Roberts Co.

Cleveland: Strong, Carlisle & Hammond

Atlanta: J. M. Tull Metal Supply Co.

Pittsburgh: Williams & Co.*

*The prices of these firms are published list prices only as to the merchant wire product line.



MARVEL SAWS

Shipbuilding calls for Universal tools.

There's a lot of sawing—cutting-off, mitering, notching and special cuts wherever ships are being built, and work comes in all sizes too. That's why you'll find MARVEL No. 8 Metal Cutting Band Saws in shipyards and Navy yards, as well as in tool rooms and die shops.

The MARVEL No. 8 is the most universal sawing machine built. It will snip off an $\frac{1}{8}$ " drill rod or cut off an 18" x 18" structural shape with equal efficiency, or will save hours of machining by roughing work to size and shape. It will cut at any angle from 45° right to 45° left, has a large "T"-slotted table (for holding irregular shapes, special fixtures, etc.) and both power and hand feeds. It is a busy machine wherever found, for it does so many different jobs and does each one well.

ARMSTRONG-BLUM MFG. CO. "The Hack Saw People"
 5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N.Y.

PERSONALS . . .

• **W. G. Hume** has been called to Washington by the Office of Production Management to act in the capacity of consultant on cold finished bars, rods, wire and wire products. Mr. Hume has been general manager of sales of Pittsburgh Steel Co., Pittsburgh for the past several years, and formerly served sales executive capacities with Northwestern Steel & Wire Co., Sterling, Ill., and Keystone Steel & Wire Co., Peoria, Ill.

• **Henry B. Duffus**, former supervisor of safety and plant protection at the Westinghouse East Springfield, Mass., Works, has been appointed mechanical safety engineer in the headquarters medical department of the Westinghouse Electric & Mfg. Co., East Pittsburgh. Mr. Duffus' duties will include safety work at the 24 plants and 33 district manufacturing and repair departments of Westinghouse throughout the country. One of his chief responsibilities will be the continued development of safety devices installed in machines to protect the operators.

• **T. Lane Watson** has been appointed manager of sales, Cincinnati district, of the Carnegie-Illinois Steel Corp. Mr. Watson, who has been assistant manager of sales, Chicago district, succeeds **William P. Andrews**, who last week was made manager of sales, Cleveland district. Mr. Watson has a continuous record of service with the United States Steel Corp. subsidiaries since 1910, when he was first employed at Pittsburgh. He has served in executive positions in the Chicago, Cleveland and Pittsburgh sales offices and since April 1938 has been assistant manager of sales, Chicago district.

• **H. R. Coward** will become manager of conduit sales of the Steel & Tubes division of Republic Steel Corp. with headquarters in Cleveland. Born in West Pittston, Pa., in 1904, Mr. Coward received his early schooling in the East and his college training at Antioch College, Yellow Springs, Ohio. He joined Steel & Tubes in 1932 working out of Kansas City. In 1937 he was moved to the Chicago office of Steel & Tubes as assistant Midwest sales manager in charge of

the company's conduit sales. In assuming his new duties in Cleveland, Mr. Coward succeeds **H. H. Benfield**, who has joined the Bull Dog Electric Products Co. in New York.

• **K. R. Beardslee** has been named sales manager in a move to centralize the sales engineering de-

partment of Carboloy Co., Inc., Detroit. Simultaneously two posts of assistant sales manager in charge of this activity have been created, and **Martin Muhling**, former special engineering executive, and **Earl Glen**, formerly Carboloy Pittsburgh representative, have been appointed to the new posts.

• **Edward M. Murphy** has been appointed division metallurgist, cold drawn, of American Steel & Wire Co., subsidiary of United States Steel Corp., with headquarters at the company's main office in Cleveland. Mr. Murphy has worked for the Wire company since August, 1920, when he started at the Newburgh Steel Works in Cleveland as a draftsman. He served as an instructor and was assigned to special work at Newburgh Wire Works before being named foreman of the cold roll department at that plant in June, 1933. He was made assistant to superintendent at Newburgh Wire Works in April, 1936, and has remained in that post to the present time.

• **E. F. Brown** has been appointed general superintendent of American, Consolidated and Newburgh Wire Works of American Steel & Wire Co., U. S. Steel Corp. subsidiary. **R. C. Helm** has been made superintendent of American Works and **H. R. Patterson** superintendent at Consolidated Works.

Mr. Brown has been associated with the Wire company since 1904, when he began as a draftsman at American Works. In 1936 he became superintendent at American Works, the post he now relinquishes to take up his new duties.

Mr. Helm started with American Steel & Wire in September, 1913, as assistant metallurgist at South Works in Worcester, Mass. In August, 1938, he was moved to Cleveland as superintendent at Consolidated Works, where he has remained to the present time.

Mr. Patterson joined Trenton Iron Co., a predecessor company of American Steel & Wire Co. in 1907, as foreman of the testing department. He was superintendent of that plant when it was consolidated with the Wire company in 1913 and held that post until 1916 when he was made superintendent at Scott Street Works, Joliet, Ill. Before becoming assistant general superintendent at Donora, Pa., Steel & Wire Works in 1938 he served as superintendent suc-



W. G. HUME, consultant on cold finished bars, rods, wire and wire products to the OPM.



WILLIAM P. ANDREWS, whose appointment as manager of sales in the Cleveland district for Carnegie-Illinois Steel Corp., was announced in these columns last week.

sively at Rockdale Works at Joliet and Rankin and Braddock Works, Pa. In November, 1940, Mr. Patterson was moved to Cleveland as an engineer in the wire drawing division of the engineering department.

• **Dr. Zay Jeffries**, consulting engineer, Lamp division, General Electric Co., has been named to the finance committee of the American Society for Metals for three years and has been reappointed consultant for a similar period to the "Metal Progress" advisory committee. Chester W. Ruth, director of advertising, Republic Steel Corp., was also appointed to serve for three years on the advisory committee of "Metal Progress," which is the official publication of the Society.

• **A. L. Nash**, attorney of Manitowoc, Wis., has been elected to fill the unexpired term of the late H. C. Gowran as a director of the Hamilton Mfg. Co., Two Rivers, Wis. Following the election of **Edward P. Hamilton** to the presidency of the firm, **Howell G. Evans** was elected vice-president in charge of sales and **Wilburg G. Dickson**, secretary and treasurer.

• **Paul K. Povlsen**, former assistant to the president of the J. I. Case Co., Racine, Wis., has been appointed vice-president in charge of production. He is a graduate of Columbia University and since 1921 has had wide experience in engineering and operations works. He was with the engineering department of the New York Telephone Co. and later was made general plant superintendent of the New Jersey Bell Telephone Co. Before going to Case, he was in charge of operations of the Diehl Mfg. Co.

• **Ralph R. Hayes** has been appointed Eastern District sales manager of the Buda Co., Harvey, Ill., with offices in the company's New York headquarters at 253 West 64th St. Mr. Hayes has been associated with the Caterpillar Tractor Co. as Eastern engine representative; with the United States Department of Justice Customs Agency, and with the Coast Guard as a line construction officer.

• **Otto P. Kossatz**, 83 Whittier Place, Indianapolis, has been appointed representative for the

Ajax Electric Co., Inc., in the states of Kentucky and Indiana with the exception of the South Bend, Ind., district.

• **Carter C. Higgins** has been made assistant general sales manager of the Worcester Pressed Steel Co., Worcester, Mass. During the last two years, Mr. Higgins has been acting in the capacity of export manager and in charge of government contract negotiations. Prior to that, he spent several years in the manufacturing division in various capacities. He is also a director of the company.

• **Elliott Harrington**, for the past year sales manager of the General Electric air conditioning and commercial refrigeration department at Bloomfield, N. J., has been named manager sales of the Schenectady induction motor section of the G-E motor division. Mr. Harrington has been connected with G-E air conditioning and automatic heating activities from their inception about 10 years ago. He entered the General Electric "test" course at Schenectady in 1919, and until 1926 was engaged in the industrial engineering and industrial control engineering departments. In 1931 began the development of other devices, for humidifying, cooling, and circulating air as well as heating it, and in 1932 General Electric established its air conditioning department, with Mr. Harrington as commercial engineer. The department was later moved to Bloomfield, and Mr. Harrington was in charge of all application engineering and cooling equipment sales. With the consolidation, in 1940, of the company's commercial refrigeration activities, he became western sales manager. He held that post until his appointment, early in 1941, as sales manager of the G-E air conditioning and commercial refrigeration department at Bloomfield.

• **W. J. Calnan, H. D. Tietz**, and **E. A. Turner** have been named assistants to J. F. McNamara, Monel sales manager, International Nickel Co., New York. At the same time **H. E. Searle**, formerly manager, engineering sales, for the Monel department, has been transferred to the nickel sales department. **C. J. Bianowicz** becomes head of the chemical section of Monel sales to succeed **E. A. Turner**.

OBITUARY . . .

• **Guy F. Strafer**, manager of the Allis-Chalmers Mfg. Co., Kansas City district office since 1923, died Nov. 23 at St. Joseph's hospital, Kansas City, after a brief illness, aged 65 years. He started with the Bullock Electric Mfg. Co., Norwood, Ohio, in 1897. Allis-Chalmers acquired the Bullock Co. in 1904. Mr. Strafer went to the Allis-Chalmers' Kansas City office in 1907, subsequently becoming its manager.

• **Clarence Addison Shaler**, famed for his invention of the vulcanizing patch outfit and who established the Shaler Co., Waupun, Wis., died in Pasadena, Cal. He was 81 years old.

• **Benjamin Russell**, president of the Alexander City Soil Pipe Co., Alexander City, Ala., died Dec. 16 at his home, aged 65 years. One of the state's most widely known industrialists, with extensive textile and other interests, Mr. Russell served as first president of the Alabama State Chamber of Commerce following its organization in 1937.

• **W. J. Radcliffe**, president of the E. A. Kinsey Co., died at his home in Cincinnati, Dec. 2. He was the senior member of the board of directors of Gidding & Lewis Machine Tool Co., Fond du Lac, Wis.

• **John R. Ferguson**, electrical engineer with the Allis-Chalmers Mfg. Co., Milwaukee, for 37 years, died Dec. 14, at his home there after a short illness. He was 61 years old.

• **John J. Ayre**, manager of the merchants trade department of the American Steel & Wire Co., Boston, died Dec. 10 at Newton, Mass. He was born in Halifax, N. S., 60 years ago and was associated with the company for 45 years.

• **Louis A. Larson**, traffic manager for the Harvey Spring & Forging Co., Racine, Wis., died suddenly at his home there Nov. 28. He was with the company for 26 years.

• **Thomas Littleton Gibson**, machine tool designer for the Bickford Machine Tool Co., Cincinnati, died recently. He was 56 years old and had been an employee of the Bickford company for 25 years.

CONSTRUCTION STEEL

... STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Pipe Lines

Carter Oil Co., National Bank of Tulsa Building, Tulsa, Okla., plans new welded steel pipe line from oil field near Tinsley, Miss., to Baton Rouge, La., about 200 miles, for crude

oil transmission for oil refinery service at latter place, where bulk station will be built. Cost about \$1,500,000 with booster pumping stations and other operating facilities. Company is a subsidiary of Standard Oil Co. of New Jersey.

Natural Gas Pipe Line Co. of America,

Inc., 20 North Wacker Drive, Chicago, has arranged for financing in amount of \$17,500,000, through note issue, a considerable part of fund to be used for extensions in pipe lines for main gas transmission, distribution lines, booster stations and other operating facilities.

Edinburg, Tex., plans bond issue of \$175,000 for pressure pipe lines for municipal natural gas distribution, including main welded steel pipe line for connection with supply source, control station, meter house and other operating equipment.

Humble Oil & Refining Co., Humble Building, Houston, Tex., plans extensions in pipe line gathering system in oil field district at Katy, Tex., including additional lines for connection with main welded steel pipe line for crude oil transmission to refining plant. Project will be carried out by Humble Pipe Line Co., first noted address. Cost over \$250,000.

Memphis Natural Gas Co., Sterick Building, Memphis, Tenn., plans extensions in welded steel pipe line system for natural gas transmission in Mississippi and Arkansas, including a new 18-in. welded steel pipe line, about 62 miles long, to parallel an existing transmission pipe line; new smaller size pipe line between Lulu, Miss., and Robinsonville, Miss., about 31 miles; line extending south from Cleveland, Miss., for distance of about 14.5 miles; and a third line of same character extending south to Eudora, Ark., about 16 miles. Also will enlarge booster station at Guthrie, La., with installation of two 1000-hp. air compressors and auxiliary equipment. Several booster stations will be built in connection with line extensions noted. Proposed to begin work on project next spring. Cost over \$1,000,000.

Quaker State Oil Refining Corp., Oil City, Pa., plans pipe line gathering system in connection with development of oil well properties in McKean County oil field district, near Bradford, Pa. Also main line for oil transmission to connection with present system, booster pumping stations, steel storage tanks and other operating facilities.

Cast Iron Pipe

Water Department, Birmingham, plans pipe line extensions and improvements in water system; also new pumping machinery for booster service, and other operating facilities. Fund of \$130,000 has been authorized for work.

Port Lavaca, Tex., asks bids until Dec. 29 for pipe line extensions in water system and other waterworks installation. Fund of \$34,000 has been secured through federal aid. F. G. Huffman, Lavaca, is engineer.

Locust Grove, Okla., plans pipe lines for water system and other waterworks installation. Cost about \$100,000. Financing is being arranged through federal aid.

Warren, Ohio, plans pipe line extensions and replacements in water system; also new treatment station, pumping plant and other waterworks installation. Cost about \$2,000,000. Financing in part will be arranged through federal aid. Havens & Emerson, Leader Building, Cleveland, are consulting engineers; W. S. Harvey is city engineer.

Board of Baltimore County Commissioners, Towson, Md., asks bids until Jan. 5 for 2300 ft. of 10-in., 2000 ft. of 8-in., and 6000 ft. of 6-in. pipe for water system at Dundalk Farms, near Dundalk, Md.

Water Department, Niagara Falls, N. Y., W. D. Robbins, city manager, plans pipe line extensions in water system; also other waterworks installation. Cost close to \$130,000. H. W. Clark is city engineer.

Bremerton, Wash., took bids Dec. 24 on 5000 ft. of 8-in., 5000 ft. of 6-in., 3500 ft. of 4-in., 3000 ft. of 3-in., and 2500 ft. of 2-in. cast iron ball and spigot pipe.

MORE SERIOUS than limited capacity

• Higher costs for finishing forgings may indicate something more serious than limited capacity of a machine tool. Higher costs often result from a waste of metal, or from a waste of machining time and labor, or from a waste of all of them. An extra five minutes required for finishing a forging unnecessarily restricts the capacity of machine tools and craftsmen, adds to finishing costs, and retards the completion of forgings for National Defense. T & W forgings, formed to close tolerances, do not require the removal of excess metal, and consequently aid in stepping up production of both machines and men. When faster finishing of forgings is the primary objective, costs usually stay in line. A T & W forging engineer can suggest how to get faster finishing of forgings.



FORGINGS

USUALLY COST LESS
AT THE POINT OF
ASSEMBLY

TRANSUE & WILLIAMS
STEEL FORGING CORPORATION

ALLIANCE, OHIO

Sales Offices: New York, Philadelphia, Chicago, Indianapolis, Detroit and Cleveland

CONSTRUCTION STEEL

Strike Halts Production At Ohio Rod and Wire Mill

Youngstown

• • • Operations at the Youngstown Sheet & Tube Co.'s rod and wire mill at Struthers were halted from midnight Dec. 17 to midnight Dec. 19, as a result of a strike, branded as "illegal" by officials of the SWOC local.

1941 Machine Tool Output Will Exceed \$750,000,000

Cleveland

• • • Machine tool shipments for November totaled \$74,600,000, according to the National Machine Tool Builders Association, which places shipments thus far in 1941 at \$690,000,000, a 73.4 per cent rise over the \$398,000,000 shipped during the first 11 months of 1940. The association estimates that full year 1941 shipments will total close to \$765,000,000, as compared with \$450,000,000 shipped during 1940.

Warehouses Aided

Washington

• • • OPM on Tuesday announced an amendment that extends an A-9 preference rating to warehouses to deliveries of iron or steel within the limits of quotas established by the order. The amendment, effective Dec. 24, was made to Order M-21-B. Under the amendment a warehouse cannot accept an order from a producer except within the limits of the quotas established. Applications for quotas are to be made on Form PD-83-A. Quotas must be computed on base tonnage during first 1941 calendar quarter.

Each warehouse getting a quota will be given a preference rating of A-9. The preference rating may be applied by a producer to deliveries of material to be physically incorporated into material to be delivered by the producer to a warehouse under the rating to replace in the producer's inventory material so delivered.

There are two limitations: 1. No producer may apply the rating to obtain material in greater quantities or on earlier dates than required to enable him to make on schedule a delivery or to place in his inventory material so briefly; 2. Endorsement must be made on purchase order or contract covered by the rating.

Weekly Bookings of Construction Steel

Week Ended	Dec. 22, 1941	Dec. 15, 1941	Nov. 25, 1941	Dec. 23, 1940	Year to Date 1941	Year to Date 1940
Fabricated structural steel awards	5,130	18,700	27,500	34,100	1,270,600	1,162,810
Fabricated plate awards	1,225	0	1,625	4,000	140,425	147,200
Sheet steel piling awards	0	0	0	10,505	26,760	76,135
Reinforcing bar awards	11,100	20,000	6,550	16,600	710,755	475,905
Total letting of Construction Steel	17,455	38,700	35,675	65,205	2,148,540	1,862,050

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Manufacturers for Over Thirty Years

MODERN Electric Propelled INDUSTRIAL TRUCKS

FOR ECONOMICAL MATERIALS HANDLING

- FORK AND RAM TRUCKS
- LOW AND HIGH LIFT TRUCKS
- COIL AND SHEET HANDLERS
- LOAD CARRIERS
- TRACTORS — CRANES

Capacities 1000 to 60,000 lbs.



Fork and Ram Trucks
Telescopic and Non-Telescopic for
Pallet and Coil Handling



Die Handlers
Heavy Duty Type
with motorized die
and unloading
platform



High Lift
Skid
Platform
Type

Cranes — Motorized Slewing
Type — Four Motor Control for
Individual and Simultaneous
Operation



Light Duty Fork Trucks



Coil and Sheet Handlers

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75 W. 87th St. CHICAGO, ILL.

MACHINE TOOLS

... SALES, INQUIRIES AND MARKET NEWS

Fresh Demand for Tools Created by War Moves

Cleveland

• • • The impact of the "shooting" war hit machine tool builders and dealers simultaneously this week as inquiries and orders multiplied for turret lathes, borers, drilling machines, presses, and practically all other types of machine tools. This has confused the delivery date situation so badly, that specific promises on high priority orders cannot be made upon receipt of the order. One observer stated that "the delivery situation has been blown wide open."

Meanwhile, in addition to Ohio Crankshaft being asked to double its capacity (see THE IRON AGE, Dec. 18), it is reported that Cleve-

land Pneumatic Tool is being sounded out to quadruple its now greatly expanded production rate. Moreover, Thompson Products and National Acme, both having recently expanded their facilities sizably, are proceeding with additional expansion. National Acme is reported in the market for many kinds of machine tools.

Accompanying this deluge of orders were reports that OPM representatives were visiting machine tool plants throughout the country urging a 24-hr. day and seven-day week wherever possible. The National Machine Tool Builders' Association reports that the Cone Automatic Machine Co. and the Davenport Machine Tool Co. will be on a 7-day basis by the end of this month. Other companies are

expected to follow, although skilled labor remains as the major obstacle to industry-wide 7-day operations.

Fortunately for the industry, the greater demands placed upon it were preceded by the announcement on Dec. 13 that hereafter orders placed by the Army, Navy, Defense Plant Corp. and their subsidiaries for critical machine tools will be accompanied by a 30 per cent cash down payment, with the balance payable 30 days from the shipment date. This good news was contained in a letter sent to various industry members by Mason Britton, chief of the tool branch of the OPM, and promises to end the difficulties that producers and dealers have had in awaiting payment for goods for anywhere from 60 to 90 days, and in some cases longer. The cash payment on war orders will aid importantly in financing the industry's abnormal operations and will relieve some dwindling cash positions.

Although the OPA apparently has deemed it unwise to place an industry-wide "ceiling" on machine tool prices, it is reported that a number of individual concerns have received notices from Washington to reduce their prices to the level existing on May 5, 1941.

Reliable sources report that a large quantity of machine tools purchased by the government for expected use in armament plants has been turned over to Russia, since it was equipment of a type that could be better used abroad than here.

WHY not let "HERCULES" (Red-Strand) Wire Rope help you meet present day production requirements and still maintain a reasonable margin of profit? You will quickly discover that "HERCULES" is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production.

Made Only By **A. LESCHEN & SONS ROPE CO.** Established 1857
5909 Kennerly Avenue, St. Louis, Mo.

New York • Chicago • Denver • San Francisco • Seattle • Portland

Brainard New Head of OPM Machine Tool Section Washington

• • • George C. Brainard, president of General Fireproofing Co., Youngstown, Ohio, has been appointed by OPM to succeed Mason Britton as director of the Machine Tool and Heavy Ordnance Section, Production Division, effective Jan. 1. Mr. Britton is a vice president of McGraw-Hill Publishing Co., New York.

NON-FERROUS METALS

... MARKET ACTIVITIES AND PRICE TRENDS

Tin Allocated; Stocks To Last For Duration

• • • The non-ferrous news spotlight during the past week centered on the OPM General Preference Order M-43, providing that no tin either in stock or afloat shall be allocated, sold, or delivered except under the authority of the Director of Priorities, and future imports may be sold only to the MRC. The notable exception to this order is that a distributor may deliver tin in less than five ton lots to regular customers, subject to the general metals order, M-1.

This rigid control of tin was imposed Dec. 17 by OPM because nearly all tin is imported from Malaya and the Netherlands East Indies, and there is but a year's supply, or 100,000 tons, on hand. OPM said that it expected to make existing supplies last for the duration of war, and that the smelter now under construction in Texas to refine Bolivian and Straits ores will be able to supply only about one-third of the annual requirements.

Placing tin under allocations completes the list of major non-ferrous metals under OPM control.

The Sharon Steel Corp. is reported to have developed a new process for electro-plating tin on steel, effecting a saving of from 40 to 50 per cent in tin. A new patent has been granted for the method, supplementing two patents previously granted. The new process consists of electro-plating a "flash" coating of another metal on the base stock, then electro-plating tin on the coating, and brightening the tin coating by melting it.

The government moved this week to take charge of more than a million dollars' worth of critical scarce materials being held in warehouses and terminals for shipment to foreign countries. These were the first seizures under the requisitioning permission granted OPM by executive order. It was estimated, in addition to

other commodities, that more than 750 tons of electrolytic copper and 34,000 lb. of tin for foreign shipment have been taken over by the Navy Department with OPM approval.

The American Zinc Co., of Ill., announced the construction of new facilities that will double the production of the electrolytic unit now in operation at Monsanto, Mo., and the installation of a flash roaster and a contact acid plant, additional smelting blocks, and by-product units at Fairmont City, Ill. These new properties will increase the combined capacity of the two plants by some 2000 tons of slab zinc per month. Built through financial aid of the DPC, it is expected that the production from the retort furnaces, 25 per cent of the new capacity, will be in operation by the end of April, and the electrolytic capacity will

be in production by the end of September.

The first refund under action taken to enforce OPA price ceilings on nickel scrap was announced Dec. 16. A major New Jersey dealer has agreed to refund amounts received in excess of the ceilings for Monel metal scrap.

Non-Ferrous Prices

(Cents per lb. for early delivery)

Copper, Electrolytic ¹	12.00
Copper, Lake	12.00
Tin, Straits, New York	52.00
Zinc, East St. Louis ²	8.25
Lead, St. Louis ³	5.70

¹ Mine producers' quotations only, delivered Conn. Valley. Deduct $\frac{1}{4}$ c. for approximate New York delivery price. ² Add 0.39c. for New York delivery. ³ Add 0.15c. for New York delivery.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 15c.-16c. a lb.; No. 12 remelt No. 2, standard, 14.50c. a lb. NICKEL electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICK-SILVER, \$199 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

the practical side of Springmaking — BY DUNBAR

SPRINGS on the Square



When springs are coiled from square wire the material becomes keystone shape \square . The keystone is more pronounced as the diameter of the spring lessens. This effect must be considered when figuring the solid height of springs made from square \square wire. For figuring this keystone effect we suggest the following formula:

$$d_1 = .48d \left(\frac{OD}{PD} + 1 \right)$$

d = Original wire size.

d_1 = Width of wire after coiling.

OD = Outside diameter of spring.

PD = Mean diameter of spring.

For best results anticipate the obstacles to good design *before* the springs are made.

Dunbar Bros. Co.

DIVISION OF ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT

"Quality Springs since 1845"

SCRAP

Revised Schedule Segregates Grades

Washington

• • • Seeking a vastly increased collection of scrap and a system of pricing that will direct a flow of better grades of scrap to plants that can use them most advantageously, OPA on Tuesday announced a revision of the iron and steel scrap schedule to meet exigencies of actual war conditions.

The revised schedule segregates the various grades of scrap according to use and establishes maximum prices for each type of consumers.

These "use" classifications are: open hearth, seven grades; blast furnace, four grades; electric furnace and foundry, eight grades (two of which with differentials for preparation to specific sizes are entirely new), and gray iron foundry, six grades of cast iron scrap.

Excluding cast iron scrap, computation of maximum scrap prices at the shipping point has been changed so that dealers may now make use of "the most favorable" basing point instead of the "nearest basing point in terms of transportation charges."

The present geographical price differentials remain unchanged. Four new basing points are added in the Pittsburgh district and it is redefined.

The greatest change is the complete segregation of all cast iron scrap into a separate appendix with a provision for maximum prices on a regional shipping point basis.

The shipping point price for the six grades of cast iron scrap are broken down into three groups: Group A, which includes Montana, Idaho, Wyoming, Nevada, Utah, Arizona, and New Mexico; Group B, which includes North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida; and Group C, which includes all other states.

The cast iron grades of scrap and their maximum shipping point prices by groups are as follows:

Type of Scrap	A	B	C
No. 1 cupola cast.....	\$18.00	\$19.00	\$20.00
No. 1 machinery cast drop broken	18.00	19.00	20.00
150 lb. and under			
Clean auto cast.....	18.00	19.00	20.00
Stove plate	14.00	15.00	16.00
Heavy breakable cast	16.50	17.50	18.50
Charging box size cast	17.25	18.25	19.25

Consumers of cast iron scrap may pay the shipping point price plus the established charge for transporting the scrap to their plant by the mode of transportation used.

The unusual provisions with respect to cast iron scrap, OPA said, are not the nature of an experiment. It is expected the incentive for collection and preparation of this type of scrap of importance to machine tool makers who use large castings for machine bids will be considerably greater than heretofore. The amendments Sept. 26 and Nov. 25, deal-

ing with "remote" scrap are now made a prominent part of the revised schedule.

The new section with regard to commissions stated that no commission may be charged unless (A) the broker guarantees the quality and delivery of an agreed tonnage of scrap; (B) the scrap is purchased by the consumer at a price not higher than the ceiling; (C) the broker sells the scrap at the same price at which he purchased it, and (D) the broker does not split the commission with any one.

No commission shall be payable to a person for scrap which he prepares.



An assist! By ATLAS

View at Prominent Iron Foundry

To Lower Costs!

Here Atlas - designed, Atlas - built equipment moves heavy scrap and other charging materials with consummate ease.

Monorail deposits empty bucket on roller conveyor. Bucket rolls down to scale platform, is charged with iron, weight read from yard crane cab. Scale platform lowers, turns, bucket rolls down to monorail for pick-up and charge to cupola.

A propitious circle, presaging profit at the year-end—and a definitely typical Atlas installation.

THE ATLAS CAR & MFG. CO.

Engineers

CLEVELAND, OHIO

Manufacturers

serving the world with mobile handling equipment

Consuming Centers

Report Receipts Low

• • • Iron and steel scrap suppliers over the nation last week were nearing their sternest test, the question of whether enough material can be found to sustain mill and foundry operations during

the critical winter months. Reports from principal market centers indicated shipments were dwindling as cold weather delayed collections and consumer goods manufacturing plants tapered production.

One important factor in the scrap trade's favor is the high degree of unity now prevailing

Cleveland Chapter to Penalize Violators

Cleveland

• • • Members of the Cleveland chapter of the Scrap Institute will be dropped if they fail to comply with orders from any government agencies pertaining to shipments of scrap to the extent that the Compliance Division of OPM has to compel such a member to do so, was the essence of a resolution adopted at a meeting held Dec. 18.

among collectors and dealers. The industry is operating at a new peak of efficiency.

Examination of latest figures shows that during 1941 more scrap was collected than ever before in the nation's history, a phenomenal achievement considering all circumstances. November consumption of iron and steel scrap was 4,482,000 gross tons, compared with 4,649,000 tons in October and 3,922,000 tons in November, 1940. In eleven months of 1941, total consumption was 48,989,000 tons of home and purchased scrap, against 37,737,000 tons in the comparable part of 1940. The Institute of Scrap Iron & Steel, Inc., says the 1941 total will exceed 53,500,000, about 12,000,000 tons ahead of the 1940 total an all-time record.

PITTSBURGH—The scrap situation is moving swiftly towards full recognition of the fact that there isn't enough scrap to go around in order to maintain 100 per cent steel operations for the time being at least. Rated steel business will be the determining factor as to whom obtains necessary material or how far operations will be allowed to drop before specific allocations are made. Some brokers in this district now are concentrating attention on demolition possibilities.

CHICAGO—Buyers and sellers are now saying that "you can't pick scrap out of the air" which about explains the entire situation here. Every mill in the district is now at the danger point. Three of the largest producers have asked for specific tonnages on allocation; but the supply is such that getting approval of an allocation and actually getting the scrap shipped are two different things. Unless unforeseen supplies of scrap come out within the next two weeks, it is expected January will see a sharp drop in operations.

ARCALOY

electrodes are available in sizes
for every welding purpose

There's a complete range of Arcaloy stainless steel electrode sizes—from one-sixteenth to five-sixteenths of an inch—for every type of welding and every analysis. Welders and metallurgists alike know that Arcaloy electrodes are dependable, uniform, and meet all chemical and physical requirements—that they come to them *waterproofed and packed in strong wooden boxes* to assure absolute safe delivery.

Manufacturers exclusively of stainless steel electrodes of all analyses, Alloy Rods Company invites your inquiry on the correct rod for your welding job.



ARCALOY electrodes have been
approved and passed by all
industries—including the most
stringent testing laboratories

ALLOY RODS COMPANY
Stainless Steel Electrodes
YORK, PENNSYLVANIA

Iron and Steel Scrap (other than railroad scrap)

(Maximum basing point prices as revised by OPA to Nov. 25, 1941, from which shipping point prices and consumers' delivered prices are to be computed, per gross ton)

Basing Points ➤		Pittsburgh	Johnstown	Weirton	Steubenville	Youngstown	Bethlehem	Claymont	Phoenixville	Harrisburg	Conshohocken	Buffalo	Toledo	Cincinnati*	Portsmouth	Middletown	Alabama City	Atlanta††	Birmingham	Chattanooga	Radford, Va	Worcester	Bridgewater	Phillipsdale, R. I.	Seattle	Los Angeles	San Francisco***	Pittsfield, Cal.	Portland, Ore.	
▼ GRADES		Kokomo	Kokomo	Kokomo	Kokomo	Kokomo	Bethlehem	Claymont	Phoenixville	Harrisburg	Conshohocken	Cleveland	Cleveland	Cleveland	Cincinnati*	Portsmouth	Middletown	Alabama City	Atlanta††	Birmingham	Chattanooga	Radford, Va	Worcester	Bridgewater	Phillipsdale, R. I.	Seattle	Los Angeles	San Francisco***	Pittsfield, Cal.	Portland, Ore.
No. 1 heavy melting.....	\$20.00	\$20.00	\$18.75	\$18.25	\$18.25	\$18.75	\$18.75	\$19.25	\$19.50	\$19.50	\$17.50	\$17.85	\$18.00	\$17.00	\$14.50	\$17.00	16.50				
No. 1 hyd. comp. black sheet.....	20.00	20.00	18.75	18.25	18.25	18.75	18.75	18.25	19.50	19.50	19.50	17.50	17.85	18.00	17.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	13.50	16.00	15.50					
No. 2 heavy melting.....	19.00	19.00	17.75	17.25	17.25	17.75	17.75	17.75	18.25	18.50	18.50	16.50	16.85	17.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	13.50	16.00	15.50					
Dealers' No. 1 bundles.....	19.00	19.00	17.75	17.25	17.25	17.75	17.75	17.75	18.25	18.50	18.50	16.50	16.85	17.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	12.50	15.00	14.50					
Dealers' No. 2 bundles.....	18.00	18.00	16.75	16.25	16.25	16.75	16.75	16.75	17.25	17.50	17.50	15.50	15.85	16.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	9.75	12.25	11.75					
Mixed boring; and turnings.....	15.25	15.25	14.00	14.25	13.50	14.00	14.00	14.50	14.75	13.10	14.75	12.75	12.75	13.10	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.25	10.00	12.50	12.00					
Machin shop turnings.....	15.50	15.50	14.25	14.50	13.75	14.25	14.25	14.75	15.00	13.35	15.00	13.00	13.35	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00		
Shoveling turnings.....	16.50	16.50	15.25	15.50	14.75	15.25	15.25	15.75	16.00	14.35	16.00	14.00	14.35	16.50	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	11.00	13.50	13.00				
No. 1 busheling.....	19.50	19.50	18.25	18.75	17.75	18.25	18.25	18.25	18.75	19.00	19.00	17.00	17.35	17.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	14.00	16.50	16.00					
No. 2 busheling.....	15.50	15.50	14.25	13.75	13.75	14.25	14.25	14.25	14.75	15.00	15.00	13.00	13.35	13.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50	10.00	12.50	12.00					
Cast iron borings.....	15.75	15.75	14.50	14.00	14.00	14.50	14.50	15.00	15.25	13.60	15.25	13.25	13.25	13.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	10.25	12.75	12.25					
Uncut structural, plate scrap.....	19.00	19.00	17.75	17.25	17.25	17.75	17.75	17.75	18.25	18.50	18.50	16.50	16.85	17.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	13.50	16.00	15.50					
No. 1 cupola.....	21.00	21.00	20.00	20.00	22.50	23.00	22.00	22.00	20.00	22.00	21.00	20.00	20.35	19.00	20.00	20.50	21.00	21.00	21.00	21.00	21.00	21.00	18.00	19.50	18.00					
Heavy breakable cast.....	19.50	19.50	18.50	18.50	21.00	21.00	21.00	21.00	18.50	20.50	20.50	19.50	18.50	18.85	17.50	18.50	19.00	19.50	19.50	19.50	19.50	19.50	17.00	18.00	16.50					
Stove plate.....	19.00	19.00	17.00	16.00	18.00	18.50	18.00	19.00	18.00	15.60	17.50	17.00	14.10	14.10	16.00	17.00	17.50	18.00	17.50	18.00	17.50	18.00	14.00	16.50	15.00					
Low phos. billet, bloom crops.....	25.00	25.00	23.75	23.75	23.25	23.75	23.75	24.25	24.50	24.50	24.50	22.50	22.85	23.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	19.50	22.00	20.50					
Low phos. bar crops, smaller.....	23.00	23.00	21.75	21.75	21.25	21.75	21.75	21.75	22.25	22.50	22.50	20.50	20.85	21.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.50	20.00	18.50					
Low phos. pu'chgs, plate scrap ¹	24.75	23.00	21.75	21.75	21.25	21.75	21.75	22.25	22.50	22.50	22.50	20.50	20.85	21.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	17.50	20.00	18.50					
Machinery cast, cupola size ²	22.00	22.00	21.00	21.00	23.50	24.00	23.50	23.50	21.00	23.00	22.00	21.00	21.35	20.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	19.00	20.50	19.00					
No. 1 mach. cast, drop-broken, 150 lb. and under.....	22.50	22.50	21.50	21.50	24.00	24.50	24.00	24.00	21.50	23.50	22.50	21.50	21.85	20.50	21.50	22.00	22.50	23.50	23.50	23.50	23.50	19.50	21.00	19.50						
Clean auto cast.....	22.50	22.50	21.50	21.50	24.00	24.50	24.00	24.00	21.50	23.50	22.50	21.50	21.85	20.50	21.50	22.00	22.50	23.50	23.50	23.50	23.50	19.50	21.00	19.50						
Punchings and plate scrap ³	23.75	22.00	20.75	20.75	20.25	20.75	20.75	21.25	21.50	21.50	21.50	19.50	19.85	20.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	16.50	19.00	17.50						
Punchings and plate scrap ⁴	22.75	21.00	19.75	19.75	19.25	19.75	19.75	20.25	20.50	20.50	20.50	18.50	18.85	19.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	15.50	18.00	16.50						
Heavy axle, forge turnings.....	21.25	19.50	18.25	18.25	17.75	17.75	18.25	18.25	18.75	19.00	19.00	19.00	17.00	17.35	17.50	16.50	16.50	16.50	16.50	16.50	16.50	14.00	16.50	15.00						
Medium 'h' yel' fl'ce turnings.....	19.75	18.00	16.75	16.75	16.25	16.75	16.75	17.25	17.50	17.50	17.50	15.50	15.85	16.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	12.50	15.00	13.50						

¹ This grade is $\frac{3}{8}$ -in. and heavier, cut 12 in. and under. ² May include clean agricultural cast. ³ Under $\frac{3}{8}$ to $\frac{1}{4}$ -in., cut 12 in. and under. ⁴ Under $\frac{3}{4}$ -in. to No. 12 gage, cut 12 in. and under. ⁵ Youngstown, Warren, Sharon and Canton are not basing points on this grade. ⁶ Middle town and Cincinnati price for this grade is \$15. ⁷ Includes Newport, Ky. Shipping point price within Cincinnati basing point may be 80c. a ton below basing point price listed above for all grades except the six cast grades. ⁸ Minneapolis and St. Paul are basing points on following grades only: No. 1 cupola, heavy breakable cast, stove plate, machinery cast cupola size, No. 1 machinery cast drop broken, clean auto cast. ⁹ Alabama City, Ala., is basing point only on No. 1 heavy melting; No. 1 compressed black sheets; No. 2 heavy melting; dealers' No. 1 and No. 2 bundles, mixed borings and turnings; machine shop turnings; shoveling turnings; No. 1 and No. 2 busheling; cast iron borings; uncut structural and plate scrap. ¹⁰ Atlanta is basing point only on No. 1 and No. 2 heavy melting; No. 1 compressed black sheets; No. 1 and No. 2 dealers' bundles. ¹¹ St. Louis basing point includes the switching district of Granite City, East St. Louis, and Madison, Ill. ¹² The San Francisco basing point includes the switching districts of South San Francisco, Niles and Oakland.

Railroad Scrap (Per gross ton, delivered consumers' plants located on lines of railroad originating scrap)

Basing Points →		Pittsburgh Sharon, Pa.	Wheeling Steubenville	Youngstown Canton	Chicago	Kokomo	Philadelphia	Wilmington	Sparrows Point	Cleveland	Buffalo	Portsmouth Middletown Ashland	Kansas City	Cincinnati	Detroit	Duluth	Birmingham	Seattle	Los Angeles San Francisco	
▼ GRADES																				
No. 1 heavy melting	\$21.00	\$19.75	\$19.25	\$19.75	\$19.75		\$19.75	\$19.75	\$20.50	\$20.25	\$20.50	\$18.50	\$17.00	\$20.50	\$18.85	\$19.00	\$18.00	\$15.50	\$18.00	
Scrap rails	22.00	20.75	20.25	20.75	20.75		20.75	21.50	21.25	21.50	21.25	19.50	21.50	19.85	20.00	19.00	16.50	19.00	20.50	
Rerolling rails	23.50	22.25	21.75	22.25	22.25		22.25	23.00	22.75	23.00	22.75	20.00	21.00	19.50	23.00	21.35	21.50	20.50	18.00	21.00
Scrap rails 3 ft. and under	24.00	22.75	22.25	22.75	22.75		22.75	23.50	23.25	23.50	23.25	21.50	20.00	23.50	21.85	22.00	21.00	18.50	21.25	21.00
Scrap rails 2 ft. and under	24.25	23.00	22.50	23.00	23.00		23.00	23.75	23.50	23.75	23.50	21.75	20.25	27.75	22.10	22.25	21.25	18.75	21.25	21.00
Scrap rails 18 in. and under	24.50	23.25	22.75	23.25	23.25		23.25	24.00	23.75	24.00	22.00	20.50	24.00	22.35	22.50	21.50	19.00	21.50	21.00	21.50

Railroads not operating in a basing point may sell rerolling rails f.o.b. their lines at average price of their sales from Sept. 1, 1940, to Jan. 31, 1941. Rerolling mills may absorb all transportation charges necessary to obtain such rails. Maximum prices for scrap rails and rerolling rails from mines, logging camps and similar sources need not be sold for less than \$13.50 a gross ton for scrap rails and \$15 for rerolling material at shipping point.

Where the railroad originator of the scrap operates in two or more of the basing points named, the highest of the maximum prices established for such basing points shall be the maximum price of the scrap delivered to a consumer's plant at any point on the railroad's line, except that switching charges of 84c. per gross ton shall be subtracted from the maximum prices of scrap originating from railroads operating in Chicago and sold for consumption outside Chicago.

Explanatory Notes

(A basing point includes its switching district)

MAXIMUM PRICE at which any grade of scrap may be delivered to consumer's plant, wherever located, is the shipping point price, plus actual transportation from the shipping point to consumer. Where shipment is by water, actual handling charges at the dock of not more than 75c. a gross ton may be included as part of transportation charges. In no case may this maximum price exceed by more than \$1 prices (for material other than railroad scrap) for the basing point nearest the consumer.

COMPUTING SHIPPING POINT PRICE: A shipping point is the point from which the scrap is to be shipped to a consumer. A shipping point price is computed as follows: (a) For Shipping Points located within a basing point.—The price established for the basing point in which the shipping point is located, is determined. Then deduct from this the actual costs involved in transporting scrap from the shipping point to the consumer's plant within the basing point which is nearest, in terms of transportation costs, to the shipping point; (b) For shipping points located outside a basing point.—The price established for the nearest basing point, in terms of transportation charges, to the shipping point is determined. Deduct from this the lowest established charge for transporting scrap from the shipping point to such basing point. *Exceptions:* (1) The shipping point price at any shipping point in New England, of those grades of scrap for which no prices are listed above shall be the Johnstown basing point price, minus the all-rail transportation costs from the New England shipping point to Johnstown; (2) Shipping point prices for New York City, Brooklyn, New York, and New Jersey shall be computed from the Bethlehem, Pa., basing point.

GULF PORT PRICES: Scrap shipped from Tampa, Pensacola, Gulfport, Mobile, New Orleans, Lake Charles, Port Arthur, Beaumont, Galveston, Texas City, Houston and Corpus Christi, has a maximum shipping point price not exceeding \$14 a gross ton, f.o.b. cars, for No. 1 heavy melting strel. For other grades, the differentials established for Birmingham apply.

REMOTE SCRAP: Defined as all grades of scrap listed in table above (exclusive of railroad scrap) located in Florida, Montana, Idaho, Wyoming, Nevada, Arizona, New Mexico, Texas and Oklahoma. Maximum shipping point price of remote scrap is \$12 a gross ton, for No. 2 heavy melting steel, with differentials for other grades the same as differentials established in table above for St. Louis. The maximum delivered price of remote scrap is the shipping point price, plus maximum transportation

charges, except that when necessary to absorb transportation charges, the maximum delivered price may be exceeded by a maximum of \$4 a ton. Thus the maximum delivered price for remote scrap may exceed the price for the nearest basing point by \$5. In the event that an allowance in excess of \$5 a ton is necessary to acquire a tonnage of remote scrap, a consumer may apply to OPA for permission to exceed the \$5 allowance. Purchases under these remote scrap provisions must be for not less than one car a month and must be reported in detail. Provisions of this remote scrap section expire Dec. 31, 1941.

BROKER COMMISSIONS: A commission of up to 50c. a ton above the maximum prices is allowed to brokers.

UNPREPARED SCRAP: Regardless of source, maximum price of unprepared scrap is \$2.50 less than maximum for corresponding grade of

BILLET AND BLOOM CROPS: Where such material originates in the Pittsburgh basing point, it may be sold delivered to a consumer within or without the Pittsburgh point at the price given in Schedule 'A', plus not more than \$2.50 in transportation charges. Lowest established transportation charges will govern.

Non-Ferrous Scrap

(Dealers buying prices, cents per lb.)

	New York	Philadelphia	Pittsburgh	Cleveland	Detroit	Chicago
No. 1 hvy. copper.	*10.00	*10.00	*10.00	*10.00	*10.00	*10.00
Light copper.....	* 8.00	* 8.00	* 8.00	* 8.00	* 8.00	* 8.00
Hvy. yel. brass.....	6.25-6.50	**6.25	7.50-8.00	5.75-6.25	7.00-7.25	7.50
Light brass.....	5.25-5.50	**5.50	7.00-7.25	6.00-6.50	6.50-6.75	7.00-7.25
No. 1 Comp. turn.	8.75-9.00	**7.75	*9.00-9.25	8.50-9.00	9.00-9.25	9.00-9.25
New brass clips.	8.00-8.25	8.50-9.00	7.75-8.00	8.00-8.50	7.50-8.00	7.75-8.25
Soft lead.....	5.25-5.50	5.00-5.25	4.75-5.00	4.75-5.00	5.00-5.25	4.75-5.00
Old zinc.....	4.00-4.25	4.25	4.25-4.50	4.00-4.50	4.25-4.50	4.50-5.00
Cast, forged alum.	*11.00	*11.00	*11.00	*11.00	*11.00	*11.00
Old sheet alum.....	*11.00	*11.00	*11.00	*11.00	*11.00	*11.00
Solder joints.....	8.75-9.00	9.00	7.50-8.00	6.50-6.75	5.50-6.00	7.50-8.00
No. 1 newter.....	35.00-36.00	35.00-36.00	31.00-32.00	32.50-34.00	32.75-38.50	32.00-34.00

• DPA maximum for sale by dealer

**** Nominal**

Comparison of Prices

(Advances Over Past Week in **Heavy Type**; Declines in *Italics*)

(Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)

	Dec. 22, 1941	Dec. 15, 1941	Nov. 25, 1941	Dec. 23, 1940
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00

Tin and Terne Plate:

(Dollars Per Base Box)

Tin plate	\$5.00	\$5.00	\$5.00	\$5.00
Manufacturing terne	4.30	4.30	4.30	4.30

Bars and Shapes: (Cents Per Lb.)

Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00

Wire and Wire Products: (Cents Per Lb.)

Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55

Rails:

(Dollars Per Gross Ton)

Heavy rails	\$40.00	\$40.00	\$40.00	\$40.00
Light rails	40.00	40.00	40.00	40.00

Semi-Finished Steel:

(Dollars Per Gross Ton)

Rerolling billets	\$34.00	\$34.00	\$34.00	\$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, bars	54.00	54.00	54.00	54.00

Wire Rods and Skelp:

(Cents Per Lb.)

Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

The various basing points for finished and semi-finished steel are listed in detailed price tables, pages 100-105.

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Dec. 22, Dec. 15, Nov. 25, Dec. 23,
1941 1941 1941 1940

Pig Iron:

	(Per Gross Ton)			
No. 2 fdy., Philadelphia	\$25.84	\$25.84	\$25.84	\$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	24.06	24.06	24.06	23.06
No. 2, Birmingham	20.38	20.38	20.38	19.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.34
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	31.34	31.34	31.34	30.34
Ferromanganese‡	120.00	120.00	120.00	120.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton. †For carlots at seaboard.

Scrap:

	(Per Gross Ton)			
Heavy melt'g steel, P'gh.	\$20.00	\$20.00	\$20.00	\$22.75
Heavy melt'g steel, Phila.	18.75	18.75	18.75	20.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	20.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	20.00
Low phos. plate, Youngs'n	23.00	23.00	23.00	26.50
No. 1 cast, Pittsburgh	22.00	22.00	22.00	22.75
No. 1 cast, Philadelphia	24.00	24.00	24.00	23.75
No. 1 cast, Ch'go*	21.00	21.00	21.00	19.25

*Changed to gross ton basis, April 3, 1941.

Coke, Connellsville:

(Per Net Ton at Oven)

Furnace coke, prompt	\$6.125	\$6.125	\$6.125	\$5.50
Foundry coke, prompt	6.875	6.875	6.875	5.75

Non-Ferrous Metals:

(Cents per Lb. to Large Buyers)

Copper, electro., Conn.*	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	50.10
Zinc, East St. Louis	8.25	8.25	8.25	7.25
Lead, St. Louis	5.70	5.70	5.70	5.35
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

*Mine producers only.

PIG IRON SCRAP STEEL

Dec. 22, 1941	\$23.61 a Gross Ton	\$19.17 a Gross Ton
One week ago	\$23.61 a Gross Ton	\$19.17 a Gross Ton
One month ago	\$23.61 a Gross Ton	\$19.17 a Gross Ton
One year ago	\$23.45 a Gross Ton	\$21.42 a Gross Ton

	High	Low	High	Low
1941	2.30467c., a Lb.	2.30467c., a Lb.	\$23.61, Mar. 20	\$23.45, Jan. 2
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6
1931	1.99629c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17

A weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip. These products represent 78 per cent of the United States output. This revised index recapitulated to 1929 in the Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Prices of Finished Iron and Steel...

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

Basing Point ↓ Product	Pitts- burgh	Chi- cago	Gary	Cle- veland	Birm- ingham	Buffalo	Youngs- town	Spars- rows Point	Granite City	Mid- town Ohio	Gulf Ports, Cars	Pacific Port's Cars	DELIVERED TO		
													Detroit	New York	Philadel- phia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled ¹	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long ternes ²	3.80¢		3.80¢									4.55¢			
STRIP															
Hot rolled ³	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled ⁴	2.80¢	2.90¢		2.80¢			2.80¢		(Worcester = 3.00¢)				2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢			2.95¢			2.95¢		(Worcester = 3.35¢)				3.05¢	3.31¢	
TIN PLATE															
Standard cokes, base box	\$5.00	\$5.00	\$5.00						\$5.10						\$5.32
BLACK PLATE															
29 gage ⁵	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ (10)			3.37¢
TERNES M'FG.															
Special coated, base box	\$4.30	\$4.30	\$4.30						\$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			(Duluth = 2.25¢)		2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel ⁶	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet) ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢	2.39¢	
Reinforcing (rail) ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢		2.47¢
Cold finished ⁸	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)					3.01¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢			(Bethlehem, Massillon, Canton = 2.70¢)			2.80¢			
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢						3.45¢			
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.25¢ ⁽¹¹⁾	2.45¢	2.65¢	2.25¢	2.29¢	2.15¢	
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢								3.70¢	4.00¢		3.71¢	3.67¢	
Alloy	3.50¢	3.50¢					(Coatesville = 3.50¢)			3.95¢	4.15¢		3.70¢	3.37¢	
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢			(Bethlehem = 2.10¢)		2.45¢	2.75¢	2.27¢	2.215¢	
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢				2.80¢				(Worcester = 3.00¢)						
0.51 to 0.75 Carbon	4.30¢				4.30¢				(Worcester = 4.50¢)						
0.76 to 1.00 Carbon	6.15¢				6.15¢				(Worcester = 6.35¢)						
1.01 to 1.25 Carbon	8.35¢				8.35¢				(Worcester = 8.55¢)						
WIRE⁹															
Bright	2.60¢	2.60¢			2.60¢	2.60¢			(Worcester = 2.70¢)			3.10¢		2.92¢	
Galvanized	2.60¢	2.60¢			2.60¢	2.60¢			(Worcester = 2.70¢)			3.10¢		2.92¢	
Spring	3.20¢	3.20¢			3.20¢				(Worcester = 3.30¢)			3.80¢		3.52¢	
PILING															
Steel sheet	2.40¢	2.40¢					2.40¢					2.95¢		2.72¢	
IRON BARS															
Common		2.25¢							(Terre Haute, Ind. = 2.15¢)						
Wrought single refined	4.40¢														
Wrought double refined	5.40¢														

¹ Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. ² Unassorted 8-lb. coating. ³ Widths up to 12 in. ⁴ Carbon 0.25 per cent and less. ⁵ Applies to certain width and length limitations. ⁶ For merchant trade. ⁷ Straight lengths as quoted by distributors. ⁸ Also shafting. For quantities of 20,000 to 39,999 lb. ⁹ Carload lot to manufacturing trade. ¹⁰ Boxed. ¹¹ Ship plates only.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are \$2 higher; f.o.b. Duluth, billets only, \$2 higher.

Per Gross Ton

Rerolling \$34.00

Forging quality 40.00

Shell Steel

Basic open hearth shell steel, f.o.b. Pittsburgh and Chicago.

Per Gross Ton

3 in. to 12 in. \$52.00

12 in. to 18 in. 54.00

18 in. and over. 56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

Per Gross Ton

Open hearth or bessemer \$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per I.b.

Grooved, universal and sheared 1.90c.

Wire Rods

(No. 5 to 9/32 in.) *Per L.b.*

Pittsburgh, Chicago, Cleveland. 2.00c.

Worcester, Mass. 2.10c.

Birmingham 2.00c.

San Francisco 2.50c.

Galveston 2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Alloy Steel Blooms, Billets and Slabs

Per Gross Ton

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem \$54.00

TOOL STEEL

(F.o.b. Pittsburgh)

Base per L.b.

High speed 67c.

High-carbon-chromium 43c.

Oil hardening 24c.

Special carbon 22c.

Extra carbon 18c.

Regular carbon 14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices are delivered quotations per gross ton computed on the basis of the official maxima.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorous	Charcoal
Boston.....	\$25.50	\$25.00	\$26.50	\$26.00	.....	.....
Brooklyn.....	27.50	.....	.....	28.00	.....	.....
Jersey City.....	26.53	26.03	27.53	27.03	.....	.....
Philadelphia.....	25.84	25.34	26.84	26.34	.....	.....
Bethlehem, Pa.	\$25.00	\$24.50	\$26.00	\$25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	24.50	.....	.....	.....	\$29.50	.....
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa.*	24.00	23.50	24.50	24.00	.....	.....
Buffalo.....	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati.....	24.44	24.61	.....	25.11	.....	.....
Canton, Ohio.....	25.39	24.89	25.89	25.39	.....	.....
Mansfield, Ohio.....	25.94	25.44	26.44	25.94	.....	.....
St. Louis.....	24.50	24.02	.....	.....	.....	.....
Chicago.....	24.00	23.50	24.50	24.00	.....	\$31.34
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland.....	24.00	23.50	24.50	24.00	.....	.....
Hamilton, Ohio.....	24.00	23.50	.....	24.00	.....	.....
Toledo.....	24.00	23.50	24.50	24.00	.....	.....
Youngstown*.....	24.00	23.50	24.50	24.00	.....	.....
Detroit.....	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc. ....	.....	.....	.....	.....	.....	\$28.00
Lyles, Tenn. fc.† ....	.....	.....	.....	.....	.....	33.00
St. Paul.....	26.63	.....	27.13	26.63	.....	.....
Duluth.....	24.50	.....	25.00	24.50	.....	.....
Birmingham.....	20.38	19.00	25.00	.....	.....	.....
Los Angeles.....	27.50	.....	.....	.....	.....	.....
San Francisco.....	27.50	.....	.....	.....	.....	.....
Seattle.....	27.50	.....	.....	.....	.....	.....
Provo, Utah.....	22.00	.....	.....	.....	.....	.....
Montreal.....	27.50	27.50	.....	28.00	.....	.....
Toronto.....	25.50	25.50	.....	26.00	.....	.....

GRAY FORGE IRON

Valley or Pittsburgh furnace \$23.50

*Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry basic, bessemer and malleable.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of basic grade (1.75 per cent to 2.25 per cent).

Phosphorous Differential: Basing point prices are subject to a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over.

†Price shown is for low-phosphorous iron; high-phosphorous sells for \$28.50 at the furnace.

Manganese Differentials: Basing point prices are subject to an additional charge not to exceed 50c. a ton for each 0.50 per cent manganese content in excess of 1.00 per cent.

WAREHOUSE PRICES

This is not a complete list of cities mentioned in Price Order No. 49

Pitts- burgh	Chi- cago	Cleve- land	Phi- ladel- phia	New York	Detroit	Buffalo	Boston	Birm- ingham	St. Louis	St. Paul	Mil- waukee	Los Angeles	
Sheets, hot rolled	\$3.35	\$3.25	\$3.35	\$3.75	\$3.58	\$3.43	\$3.25	\$3.71	\$3.45	\$3.39	\$3.30	\$3.38	\$4.65
Sheets, cold rolled .....	.....	4.10	4.05	4.05	4.60	4.30	4.30	4.68	.....	4.24	4.35	4.23	6.85
Sheets, galvanized	4.65	4.85	4.75	5.00	5.00	4.84	4.75	5.11	4.75	4.99	4.75	4.98	5.85
Strip, hot rolled	3.60	3.60	3.50	3.95	3.96	3.68	3.82	4.06	3.70	3.74	3.65	3.73	5.00
Strip, cold rolled	3.20	3.50	3.20	3.31	3.51	3.40	3.52	3.46	.....	3.61	3.83	3.54	.....
Plates.....	3.40	3.55	3.40	3.75	3.76	3.60	3.62	3.85	3.55	3.69	3.80	3.68	4.50
Structural shapes.....	3.40	3.55	3.58	3.75	3.75	3.65	3.40	3.85	3.55	3.69	3.80	3.68	4.50
Bars, hot rolled	3.35	3.50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.64	3.75	3.63	**4.50
Bars, cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300.....	7.45	7.35	7.55	7.31	7.60	7.67	7.35	7.75	.....	7.72	7.45	7.58	9.55
Bars, ht. rld. SAE 3100.....	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	.....	6.02	6.00	5.88	8.55
Bars, ed. drn. SAE 2300.....	8.40	8.40	8.40	8.56	8.84	8.70	8.40	8.88	.....	8.77	8.84	8.63	10.55
Bars, ed. drn. SAE 3100.....	6.75	6.75	7.75	7.16	7.19	7.05	6.75	7.23	.....	7.12	7.44	6.98	9.55

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb., galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exemptions: Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb., cold rolled strips, 0.0971 in. thick; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb., cold rolled strip 0.095 in. and lighter; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; Los Angeles, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 24 ga.—1 to 1499 lb. Extras for size, quality, etc., apply on above quotations. *12 gauge and heavier. \$3.43. **Over 4 in. wide and over 1 in. thick. \$4.95.

PRICES

CORROSION AND HEAT-RESISTING STEELS

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.73c.	16.15c.	19.13c.	23.38c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hotstrip	17.00c.	17.50c.	24.00c.	25.00c.
Cold st.	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
*Motor	4.95c.
*Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 75c. per 100 lb.

*In some instances motor grade is referred to as dynamo grade and dynamo grade is referred to as dynamo special.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, per package of 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C...	\$6.00	\$12.00
15-lb. coating I.C...	7.00	14.00
20-lb. coating I.C...	7.50	15.00
25-lb. coating I.C...	8.00	16.00
30-lb. coating I.C...	8.63	17.25
40-lb. coating I.C...	9.75	19.50

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine and Carriage Bolts:
6 1/2 in., shorter and smaller... 65 1/2
6 x 5/8 in., and shorter..... 63 1/2
6 in. by 3/4 to 1 in. and shorter.. 61
1 1/8 in. and larger, all length.. 59
All diameters over 6 in. long.. 59
Lag, all sizes..... 62
Plow bolts

Nuts, Cold Punched or Hot Pressed:
(hexagon or square)
1/2 in. and smaller..... 62
9/16 to 1 in. inclusive..... 59
1 1/8 to 1 1/2 in. inclusive..... 57
1 5/8 in. and larger..... 56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

PRICES

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
7/16 in. and smaller...	64	
1/2 in. and smaller...	62	..
1/2 in. through 1 in...	60	
9/16 to 1 in.....	59	..
1 1/8 in. through 1 1/2 in..	57	58
1 5/8 in. and larger....	56	

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose

71 and 10

Stove bolts in packages, with nuts attached

71

Stove bolts in bulk..... 80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York lots of 200 lb. or over.

Large Rivets

(1/2 in. and larger)

Base per 100 lb

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

\$3.75

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

65 and 5

Cap and Set Screws

Per Cent Off List

Upset hex. head cap screws U.S.S. or S.A.E. thread, 1 in. and smaller

60

Upset set screws, cup and oval points

68

Milled studs

40

Flat head cap screws, listed sizes

30

Filister head cap, listed sizes...

46

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

WIRE PRODUCTS

(To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

Base per Keg

Standard wire nails

\$2.55

Coated nails

2.55

Cut nails, carloads.....

3.85

Base per 100 Lb.

Annealed fence wire..... \$3.05

Base Column

Woven wire fence*..... 67

Fence posts (carloads)..... 69

Single loop bale ties..... 59

Galvanized barbed wire†..... 70

Twisted barbless wire..... 70

*15 1/2 gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes Minimum Wall

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Lap	Seamless	Weld	Cold	Hot	Hot	Drawn	Rolled	Rolled	\$	\$	\$
2 in. o.d. 13 B.W.G. 15.03	13.04	12.38										
2 1/2 in. o.d. 12 B.W.G. 20.21	17.54	16.58										
3 in. o.d. 12 B.W.G. 22.48	19.50	18.35										
3 1/2 in. o.d. 11 B.W.G. 28.37	24.62	23.15										
4 in. o.d. 10 B.W.G. 35.20	30.54	28.66										

(Extras for less carload quantities)

40,000 lb. or ft. over..... Base

30,000 lb. or ft. to 39,999 lb. or ft. 5%

10,000 lb. or ft. to 29,999 lb. or ft. 10%

5,000 lb. or ft. to 9,999 lb. or ft. 30%

2,000 lb. or ft. to 4,999 lb. or ft. 45%

Under 2,000 lb. or ft..... 65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
(F.o.b. Pittsburgh only on wrought pipe)

Base Price = \$200 Per Net Ton

Steel (Butt Weld)

	Black	Galv.
1/2 in.	63 1/2	51
5/8 in.	66 1/2	55
1 to 3 in.	68 1/2	57 1/2

Wrought Iron (Butt Weld)

	24	3 1/2
1/2 in.	24	3 1/2
5/8 in.	30	10
1 and 1/4 in.	34	16
1 1/2 in.	38	18 1/2
2 in.	37 1/2	18

Steel (Lap Weld)

	61	49 1/2
2 1/2 and 3 in.	64	52 1/2
3 1/2 to 6 in.	66	54 1/2

Wrought Iron (Lap Weld)

	30 1/2	12
2 in.	30 1/2	12
2 1/2 to 3 1/2 in.	31 1/2	14 1/2

Steel (Butt, extra strong, plain ends)

	Black	Galv.
1/2 in.	61 1/2	50 1/2
5/8 in.	65 1/2	54 1/2
1 to 3 in.	67	57

Wrought Iron (Same as Above)

	25	6
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PRICES

FERROALLOYS	
Ferromanganese	
F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans, Domestic, 80%, per gross ton (carloads)	\$120.00
Spiegeleisen	Per Gross Ton Furnace
Domestic, 19 to 21%	\$36.00
Domestic, 26 to 28%	49.50
Electric Ferrosilicon	(Per Gross Ton, Delivered Lump Size)
50% (carload lots, bulk)	\$74.50
50% (ton lots, packed)	87.00
75% (carload lots, bulk)	135.00
75% (ton lots, packed)	151.00
Silvery Iron	(Per Gross Ton, base 6.00 to 6.50 \$4)
F.O.B. Jackson, Ohio	\$29.50*
Buffalo	\$30.75*
For each additional 0.50% silicon add \$1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add \$1 a ton for 0.75% phosphorus or over.	
*Official OPACS price established June 24.	
Bessemer Ferrosilicon	
Prices are \$1 a ton above Silvery Iron quotations of comparable analysis.	
Ferrochrome	(Per Lb. Contained Cr, Delivered Carlots, Lump Size, on Contract)
4 to 6 carbon	13.00c.
2 carbon	19.50c.
1 carbon	20.50c.
0.10 carbon	22.50c.
0.06 carbon	23.00c.
Spot prices are 1/4c. per lb. of contained chromium higher.	

ORES

Lake Superior Ores (51.50% Fe.)	
(Delivered Lower Lake Ports)	
Per Gross Ton	
Old range, bessemer, 51.50	\$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35
Foreign Ores*	
(C.I.F. Philadelphia or Baltimore, Exclusive of Duty)	
Per Unit	
African, Indian, 44-48 Mn.	.65c. to 66c.
African, Indian, 49-51 Mn.	.67c. to 69c.

COKE*

Furnace	Per Net Ton
Connellsville, prompt	...\$6.00 to \$6.25

Foundry	
Connellsville, prompt	...\$6.75 to \$7.00

*Maximum coke prices established by OPA became effective Oct. 1, 1941. A complete schedule of the ceiling prices was published in THE IRON AGE, Sept. 25, p. 94B. †F.O.B. oven.

Silico-Manganese

(Per Gross Ton, Delivered, Lump Size, Bulk, on Contract)	
3 carbon	\$113.00*
2.50 carbon	118.00*
2 carbon	123.00*
1 carbon	133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del'd carload	\$2.00
Ferrotungsten, 100 lb. and less	\$2.25
Ferrovanadium, contract, per lb. contained V, del'd	\$2.70 to \$2.90†
Ferrocolumbium, per lb. contained Cb, f.o.b. Niagara Falls, N. Y., ton lots	\$2.25†
Ferrocarbontitanium, 15-18 Ti, 7-8 C, f.o.b. furnace, carload, contract, net ton	\$142.50
Ferrocarbontitanium, 17-20 Ti, 3-5 C, f.o.b. furnace, carload, contract, net ton	\$157.50

Ferrophosphorus, electric or blast furnace material, carloads, f.o.b. Anniston, Ala., for 18%, with \$3 unitage freight, equalized with Rockdale, Tenn., gross ton	\$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., \$3 unitage, freight equalized with Nashville, gross ton	\$75.00
Ferromolybdenum, per lb. Mo, f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo, f.o.b. furnace	80c.
Molybdenum oxide briquettes 48-52 Mo, per lb. contained Mo, f.o.b. Langloch, Pa...	80c.
Molybdenum oxide, in cans, per lb. contained Mo, f.o.b. Langloch, and Washington, Pa.	80c.

*Spot prices are \$5 per ton higher.	
†Spot prices are 10c. per lb. of contained element higher.	

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., gross ton	\$40.00
Angle bars, 100 lb.	2.70

(F.o.b. Basing Points) Per Gross Ton

Light rails (from billets)	\$40.00
Light rails (from rail steel)	39.00

Base per Lb.

Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	68.5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steeltown, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail	\$25.00
Domestic, f.o.b. Ohio River landing barges	25.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	25.00
Foreign, 85% calcium fluoride, not over 5% Si, c.i.f. Atlantic ports, duty paid	Nominal
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2 1/2% silicon, f.o.b. Illinois and Kentucky mines	\$34.00
As above, in bags, f.o.b. same mines	36.40

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

Per 1000

Super-duty brick, St. Louis	\$64.60
First quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	51.30
First quality, New Jersey	56.00
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick	
Pennsylvania	\$51.30
Chicago District	58.90
Birmingham	51.30
Silica cement, net ton (Eastern)	9.00

Chrome Brick	Per Net Ton
Standard, f.o.b. Baltimore, Plymouth Meeting and Chester	\$54.00
Chemically bonded, f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	54.00

Magnesite Brick	
Standard f.o.b. Baltimore and Chester	\$76.00
Chemically bonded, f.o.b. Baltimore	65.00

Grain Magnesite	
Domestic, f.o.b. Baltimore and Chester in sacks	\$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

SALES POSSIBILITIES

... CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic States

• **Wyman-Gordon Co.**, 105 Madison Street, Worcester, Mass., automotive forgings, etc., has let general contract to E. J. Cross Co., 150 Prescott Street, for three one-story additions, with largest unit for a heat-treating department, and two smaller structures for a cooling pit and oil storage and distribution, respectively. Cost about \$160,000 with equipment.

Portland Foundry Co., Portland, Conn., iron castings, has let general contract to C. A. Larson, Strickland Street, for one-story and basement addition, about 45 x 90 ft. Cost close to \$40,000 with equipment.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., has leased about 40,000 sq. ft. additional space in former local mill of United States Rubber Co., for expansion in gun-manufacturing division, including parts production and assembling.

Acme Wire Co., 1255 Dixwell Avenue, Hamden, Conn., electrical wire, coils, condensers, etc., has asked bids on general contract for new steam power house. Cost close to \$65,000, with boiler units, pumps and auxiliary equipment. Westcott & Mapes, Inc., 139 Orange Street, New Haven, Conn., is consulting engineer.

Construction Quartermaster, Section F, Army Base, Boston, plans immediate call for bids on general contract for one-story shop at Watertown arsenal, 160 x 460 ft., with craneways and other facilities. Coolidge, Shepley, Bulfinch & Abbott, 1 Court Street, Boston, are architects.

Cole-Hersee Co., 54 Old Colony Avenue, South Boston, electrical and automotive equipment, has let general contract to James S. Mozzicato, 168 Mystic Avenue, Medford, Boston, for new one-story and basement plant, 60 x 125 ft., with wing extension, 18 x 45 ft., at C and Baxter Streets. Cost about \$75,000 with equipment. David J. Abrahams, 260 Tremont Street, Boston, is architect.

Bureau of Yards and Docks, Navy Department, Washington, has let general contract to Leonard Construction Co., 420 Lexington Avenue, New York, for additions to Navy fuel depot, Melville, R. I., including underground storage tanks to cost about \$2,100,000; steam power plant for central-heating, cost about \$750,000; electric power lines, pipe lines for water and sewage systems, and other utilities, cost \$200,000.

B. G. Corp., 136 West Fifty-second Street, New York, spark plugs and ignition equipment, has let general contract to Bonanno Construction Co., 8533 Tonnelle Avenue, North Bergen, N. J., for new one-story plant on 11-acre tract at Ridgefield, N. J., recently acquired. Cost over \$85,000 with equipment. James J. Rothstein, 220 Hutton Street, Jersey City, N. J., is architect. New York plant will be continued as heretofore.

Cameron Machine Co., 61 Poplar Street, Brooklyn, slitting and roll-winding machines, and other machinery for paper, rubber and other process industries, has let general contract to Rubsamen Construction Co., 90-50 Parsons Boulevard, Jamaica, L. I., for one-story addition, 76 x 95 ft., for expansion in machine shop and assembling department. Cost close to \$75,000 with equipment. Harry M. Sushan, 367 Fulton Street, is architect.

International Diesel Electric Co., Inc., 7 Dey Street, New York, automatic diesel-electric generating plants, parts, etc., with main works at 42-22 Crescent Avenue, Long Island City, has leased two-story building on site 100 x 100 ft., at 36-50 Thirty-eighth Street, Long Island City, and will remodel for expansion in production and service departments.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for 15 motor-driven centrifugal pumps and spare parts for water service, for Brooklyn and Mobile, Ala., Navy yards (Schedule 9720); until Jan. 9 for nine 500-kw. diesel engine-

generator sets, with accessories, for emergency service, for Brooklyn, Philadelphia and Norfolk, Va., yards (Schedule 9721); 365 hand-driven testing generators for Brooklyn and Mare Island yards (Schedule 9702).

Castle Dome Copper Co., a subsidiary of Miami Copper Co., 61 Broadway, New York, plans new mining and refining plant at Miami, Ariz., for production for government, comprising with storage and distribution units, machine shops, power house and other structures. Cost about \$9,000,000, fund to be furnished by Defense Plant Corp., Washington.

National Biscuit Co., Shredded Wheat Bakeries, Inc., Niagara Falls, N. Y., has arranged with Niagara Falls Power Co. for purchase of tract adjoining plant on Ninth Street, for multi-story addition. Cost over \$100,000 with equipment.

Division of Purchase and Supplies, City Hall, Rochester, N. Y., plans one-story machine shop, about 60 x 150 ft. Cost over \$50,000 with equipment.

War Department, Twentieth Street and Constitution Avenue, N. W., Washington, is securing site about eight miles from Syracuse, N. Y., for new bombardment air field and base, to include two or three hangars, each about 120 x 200 ft., machine shops, oil storage and fueling system, and other structures in addition to barracks, mess houses, etc. Cost about \$7,500,000. Office of Chief of Air Corps, Washington, is preparing plans.

Mack Mfg. Corp., 97 Jersey Avenue, New Brunswick, N. J., motor trucks and parts, has acquired adjoining tract of about two and one-half acres, heretofore held by Empire Chemical Co., including two one-story buildings, about 20,000 sq. ft. of floor space, for expansion. Also has plans for one-story addition, about 100,000 sq. ft. of floor space, on remainder of site, for new production unit for transmissions for Army tanks for government. Cost over \$500,000 with equipment. Lockwood Greene Engineers, Inc., 10 Rockefeller Plaza, N. Y., is architect and engineer. Empire company noted, with main plant at 96 Roanoke Avenue, Newark, N. J., has purchased plant of Newkraft Mfg. Co., Codewise Avenue, New Brunswick, and will improve for new plant, removing both New Brunswick and Newark plants to that location, where production will be concentrated and increased.

Gus Reinke Machinery & Tool Co., 63 Dicker-son Street, Newark, N. J., has let general contract to Schroeder Construction Co., 1009 Eighteenth Avenue, for new one-story plant, about 125 x 169 ft., with part one and one-half stories, on Hillside Avenue, Hillside, N. J., for production of machine equipment for government, which has provided fund of \$120,600 through Defense Plant Corp., Washington.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids Dec. 29 for cast iron elbows (Circular 1299).

Superior Marking Machines Co., 45 Lispenard Street, New York, has let general contract to Inter-State Construction Co., 418 Fifteenth Avenue, Paterson, N. J., for new one-story plant, about 80 x 100 ft., at Ridgefield, N. J. Cost over \$50,000 with equipment. J. J. Glos-ter & Co., 303 West Forty-second Street, New York, are architects and engineers.

Kellett Autogiro Corp., 5701 Grays Ferry Avenue, Philadelphia, aircraft and parts, has leased one-story plant at Upper Darby, Pa., with option to purchase, totaling about 26,000 sq. ft. of floor space, heretofore held by Gulf Oil Corp., Pittsburgh, for expansion in parts production and assembling.

McNeil Laboratories, Inc., 2900 North Seventeenth Street, Philadelphia, drugs and chemicals, has let general contract to Barclay White Co., 22 North Thirty-sixth Street, for four-story addition, about 98 x 125 ft. Cost close to \$100,000 with equipment. Clarence E. Wunder Associates, Architects' Building, is architect.

Bureau of Supplies and Accounts, Navy De-

partment, Washington, asks bids until Jan. 6 for two 1000-kw., 240-volt, turbine-generator units, two circuit breakers and spare parts for Philadelphia Navy Yard (Schedule 9744).

Fraser-Brace Engineering Co., Inc., 10 East Fortieth Street, New York, has concluded agreement with War Department, Washington, for new plant at Geneva, Pa., for production of TNT. It will comprise one and multi-story buildings, with machine shops, power house, administration building and other structures. Plant will be known as Keystone Ordnance Works, and will cost about \$30,138,500, fund to be furnished by Defense Plant Corp., Washington.

American Locomotive Co., Railways Steel Spring Division, Latrobe, Pa., has asked bids on general contract for one-story addition for a forge shop, including craneway and other facilities. Cost over \$85,000 with equipment. Prack & Prack, Martin Building, Pittsburgh, are architects.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for three 25-ton traveling revolving jib cranes for Pearl Harbor Navy Yard, T. H. (Specification 10776).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 6 for motor-driven automatic screw machines (Schedule 9758), metal gaskets (Schedule 9657), 240 centrifugal water pumps (Schedule 9710); until Jan. 9, motor-driven precision lathes (Schedule 9741), universal grinders (Schedule 9733) for Eastern and Western yards.

The South

• **E. I. du Pont de Nemours & Co., Inc.**, Wilmington, Del., has closed agreement with War Department, Washington, for expansion in plant now in course of construction at Morgantown, W. Va., for production of synthetic ammonia for government, comprising new unit for manufacture of chemicals for war service. It will be located on adjoining tract and will include storage and distribution structures, machine shop, power station and other buildings. Cost about \$15,000,000, fund to be furnished by Defense Plant Corp., Washington. Ammonia works noted will represent investment of close to \$40,000,000.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Jan. 9 for 190 submersible motor-driven, portable pumping units, with motors, controllers and spare parts, for Norfolk, Va., Navy Yard (Schedule 9725); until Jan. 8 for 270 gasoline engine-driven portable pumping units with spare parts, for Norfolk and Mare Island yards (Schedule 9660).

White Provision Co., Howell Mill Road and Fourteenth Street, N. W., Atlanta, Ga., meat packer, affiliated with Swift & Co., Chicago, has asked bids on general contract for two-story addition for expansion in processing and packing divisions. Cost over \$80,000 with equipment.

Port Newark Shipbuilding Corp., 17 Battery Place, New York, recently organized to build and operate shipyard at Port Newark, Newark, N. J., for construction of concrete oil barges for United States Maritime Commission, Washington, recently noted, has abandoned plans for yard at place mentioned owing to labor costs, and will transfer project to Savannah, Ga., where waterfront site is being secured. Cost over \$400,000, including shipways, wharves, shops, power station and auxiliary structures.

Western North Carolina Membership Corp., Marshall, N. C., care of Mark W. Bennett, Marshall, division manager, Northwest Carolina Utilities, Inc., same place, president, recently organized with capital of \$10,000,000, plans hydroelectric generating stations and large central steam-electric generating station for power supply for rural electric systems



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SALES POSSIBILITIES

in about 31 counties in western North Carolina and eastern Tennessee. Cost over \$5,000,000. Financing will be arranged through Federal aid.

Seven-Up Bottling Co., 520 Fayetteville Road, Raleigh, N. C., plans new two-story mechanico-bottling, storage and distributing plant at South and McDowell Streets. Cost over \$50,000 with equipment.

Hughes Tool Co., 300 Hughes Street, Houston, Tex., oil well tools and kindred equipment, has arranged with War Department, Washington, for new plant near city for production of gun tubes and cannon for government. It will be known as Dickson Gun Plant, and will cost about \$12,000,000 for site, buildings and machinery. Fund in that amount will be furnished by Defense Plant Corp., Washington.

Purchasing and Contracting Officer, Fort Bragg, N. C., asks bids until Dec. 30 for nails, spikes, bolts, screws, wire brads, galvanized wire rope clips, barbed fencing wire, washers and other equipment (Circular UO-159-4).

Central States

• **American Steel Foundries**, Alliance, Ohio, has approved plans for several one-story additions for expansion in core room, main foundry, cleaning and finishing departments, and auxiliary divisions. Cost over \$500,000 with equipment. Main offices are at 410 North Michigan Avenue, Chicago.

Taylor-Winfield Corp., Anderson Street, Warren, Ohio, electric welding machines and parts, has purchased local plant of Warren City Tank & Boiler Co., and will modernize for production of machine tool bases, frames and other equipment for government.

Pioneer Mold Co., 4020 Broadway Avenue, Cleveland, molds for plastics and kindred products, has let general contract to R. J. Platten Concrete Contracting Co., Scranton Road and West Twenty-fifth Street, for one-story addition, 40 x 100 ft. Cost close to \$45,000 with equipment.

War Department, Washington, plans new bombardment air field and base near Columbus, Ohio. It will include several hangars, approximately 120 x 200 ft., with machine shops, oil and gasoline storage tanks and facilities, gasoline fueling system and other structures; also barracks, mess buildings, equipment structures, etc. Cost about \$7,500,000. Plans are being prepared by Office of Chief of Air Corps, Washington.

Yoder Co., 5500 Walworth Avenue, Cleveland, special machinery and parts, has let contract to City Iron Works, Inc., 7210 Kinsman Avenue, for one-story addition, 75 x 300 ft. Cost close to \$85,000 with equipment. Wallace H. Hatch, Hippodrome Building, is architect.

Electric Auto Light Co., Champlain and Mulberry Streets, Toledo, automobile starting and lighting equipment, automobile heaters, etc., has approved plans for one-story addition to branch plant at Fostoria, Ohio, 100 x 150 ft. Cost over \$85,000 with machinery.

Cleveland Automatic Machine Co., 2269 Ashland Road, Cleveland, will award contract soon for three one-story additions, about 50 x 160 ft., 20 x 120 ft., and 48 x 60 ft. Cost close to \$100,000 with equipment. C. B. Rowley, Keith Building, is architect; Frank Eroskey, 7829 Euclid Avenue, is engineer.

Packard Mfg. Corp., 1200 Kentucky Avenue, Indianapolis, talking machines and parts, has arranged for purchase of one-story building at 2900 North Columbia Avenue, totaling 45,000 sq. ft. of floor space, for branch plant for production of parts for Army tanks for Pressed Steel Car Co., Baldwin Locomotive Works and Lima Locomotive Works, all holding contracts with government for production of Army tanks. Company will take over property early in January and will employ close to 500 men.

Tokheim Oil Tank & Pump Co., Wabash Avenue, Fort Wayne, Ind., gasoline pumps, parts, etc., gasoline dispensing systems, plans one-story addition. Cost over \$100,000 with equipment.

Monsanto Chemical Co., 1700 South Second Street, St. Louis, will take bids soon for two-

story addition to plant at Monsanto, Ill., for production of chemicals for War Department, Washington, near similar works, now being completed, for manufacture of gas warfare chemicals for government. Cost about \$310,000 with equipment.

Watkins, Inc., 710 East First Street, Wichita, Kan., iron and steel products, iron castings, etc., plans new one-story plant at Second and Sycamore Streets, for fabricating division, foundry, storage and distribution, and other service, totaling about 250,000 sq. ft. of floor space. Cost over \$700,000 with machinery. Forsblom & Parks, Beacon Building, are architects.

Springfield Wagon & Trailer Co., Springfield, Mo., has taken over one-story building, about 76 x 155 ft., and will remodel for expansion.

City Council, Lindsborg, Kan., will make improvements in municipal power station, including new engine-generator unit and accessory equipment. Cost about \$51,000. Bond issue in that amount has been authorized.

Eclipse Counterbore Co., 7410 St. Aubin Avenue, Detroit, core drills, counterbores, countersinks, etc., has let general contract to Austin Co., Cleveland, for new one-story plant at Ferndale, near Detroit. Cost close to \$50,000 with equipment.

Great Lakes Engineering Works, River Rouge, Detroit, operating a ship-building plant, has let general contract to Barton-Malow Co., 2631 Woodward Avenue, for one-story shop addition, about 40 x 270 ft., with office structure adjoining. Cost over \$65,000 with equipment.

Arrow Tool & Reamer Co., 422 North Livernois Street, Detroit, plans new one-story plant on Eight-Mile Road, near city limits. Cost about \$60,000 with equipment. Paul R. Sewell, 2631 Woodward Avenue, is architect.

Metal-Glass Products Co., Belding, Mich., stainless steel tanks and kindred equipment, plans one-story addition. Cost over \$45,000 with equipment.

Campbell, Wyant & Cannon Foundry, Inc., Muskegon Heights, Mich., automotive castings, etc., has let general contract to Peter Ramberg, Muskegon, Mich., for one-story addition to main foundry, 120 x 350 ft. Cost over \$200,000 with equipment. C. R. Jensen and H. J. Keough, 3757 Gladstone Street, Detroit, are architects.

Impression Die Co., 4672 Bellevue Avenue, Detroit, steel dies, etc., has let general contract to F. H. Martin Construction Co., 955 East Jefferson Avenue, for one-story addition. Cost close to \$50,000 with equipment. Pollmar, Ropes & Lundy, 2539 Woodward Avenue, are architects.

Aetna Ball Bearing Mfg. Co., 4600 West Schubert Street, Chicago, has let general contract to William J. Scown Building Co., 54 West Randolph Street, for one-story addition, 60 x 150 ft., for production of roller thrust bearings for propellers for government. Fund of \$410,000 has been authorized by Defense Plant Corp., Washington, for building and equipment.

Ilg Electric Ventilating Co., 2850 North Pulaski Road, Chicago, fans, blowers, air-conditioning equipment, etc., has asked bids on general contract for two-story addition, 40 x 120 ft. Cost over \$50,000 with equipment. Alfred S. Alschuler and Ralph N. Friedman, Inc., 28 East Jackson Boulevard, are architects.

Kewaunee Shipbuilding & Engineering Corp., Kewaunee, Wis., plans one-story shop, 80 x 190 ft., at shipyard near Kewaunee Basin, water-front. Cost close to \$60,000 with equipment. Gordon Feldhausen and Gardner Coughlen, Columbus Building, Green Bay, Wis., are architects.

Borg-Warner Corp., 310 South Michigan Avenue, Chicago, automotive products, pumping machinery, tools, etc., has purchased all machinery at plant of Stover Mfg. & Engine Co., Freeport, Ill., engines, grinding machinery, etc., with exception of foundry equipment, and will remove to one of branch plants for expansion in production for government.

Land O' Lakes Creameries, Inc., 2201 Kennedy Street, N. E., Minneapolis, will take bids soon on general contract for new two and three-story milk dehydration plant at Milaca,

Minn., 66 x 115 ft., with generating station, boiler house and auxiliary structures. Cost close to \$150,000 with processing and other machinery. Also for a similar dehydration plant at Litchfield, Minn., two and three stories, 85 x 132 ft., with boiler house and other structures, to cost close to like amount. General contract has been let to John Schneider, Independence, Wis., for two-story similar plant, 100 x 133 ft., with machine shop, engine house and other structures at Whitehall, Wis. Cost over \$225,000 with processing machinery and accessory equipment. Max Buetow, 1931 University Avenue, St. Paul, is architect for all plants.

Austin-Western Road Machinery Co., Inc., North Farnsworth Avenue, Aurora, Ill., road-building machinery, rock crushers, etc., has let general contract to Algol B. Larson, 3837 West Street, Chicago, for one-story addition, 27 x 305 ft., for shop, storage and distribution departments. Cost close to \$85,000 with equipment. E. O. Sessions & Co., 120 South LaSalle Street, Chicago, are consulting engineers.

Western States

• **California Wire Cloth Corp.**, 1001 Twenty-second Avenue, Oakland, Cal., wire cloth and other wire goods, has let general contract to W. E. Lyons, 3454 Harlan Street, for one-story addition for storage and distribution. Cost close to \$50,000 with equipment.

West Coast Paperboard Mills, Inc., Los Angeles, recently organized to manufacture paper and paperboard products, care of M. J. Gabrielson, 6362 Hollywood Boulevard, engineer, has asked bids on general contract for new one-story and basement mill, 60 x 277 ft., with basement section, 42 x 115 ft., at Eastern Avenue and Sixty-first Street. Cost close to \$90,000 with machinery.

Isaacsen Iron Works, Inc., 2917 East Marginal Way, Seattle, marine forgings, steel automobile bodies, and other iron and steel products, has let general contract to Henrik Valle Co., 407 Third Avenue West, for new plant at 8531 East Marginal Way, for production of equipment for government, including main one-story structure, 332 x 440 ft., for heat-treating division, forge department, machine shop, erection shop and other departments; also power house, laboratory, fuel oil tanks and auxiliary structures. Cost close to \$1,000,000 with machinery.

Public Works Officer, Puget Sound Navy Yard, Bremerton, Wash., asks bids until Jan. 7 for new one-story pattern shop and foundry, and extensions to storehouse at naval torpedo station, Keyport, Wash., 61 x 121 ft., and 53 x 153 ft., in order noted (Specification 10771).

California Metals & Engineering Co., 1010 North McCadden Place, Los Angeles, has plans for one and two-story addition, 90 x 140 ft. A traveling crane will be installed. Cost over \$60,000 with equipment. John M. and Thomas R. Cooper, 9615 Brighton Way, Beverly Hills, near Los Angeles, are architect and engineer.

Oliver United Filters, Inc., 2900 Glasscock Street, Oakland, Cal., filters, pumps, compressors and kindred machinery, plans one-story addition for expansion in production. Cost close to \$50,000 with equipment.

Canada

• **Sehl Engineering Co.**, Mill Street, Kitchener, Ont., machine and mechanical equipment, is erecting one-story machine shop, about 80 x 100 ft., for which general contract recently was let to Ball Brothers, Ltd., 49 King Street East. Cost about \$65,000 with equipment.

Werner G. Smith, Ltd., 134 Royce Avenue, Toronto, industrial oil products, has let general contract to Jackson-Lewis Co., Ltd., 320 Bay Street, for one-story addition. Cost close to \$85,000 with equipment. N. A. Armstrong, 19 Merlinda Street, is architect.

Hull Iron & Steel Foundries, Ltd., 207 Montcalm Avenue, Hull, Que., plans one-story foundry addition. Cost about \$50,000 with equipment. Richards & Abra, 55 Metcalfe Street, Ottawa, Ont., are architects.